European University Institute

DEPARTMENT OF POLITICAL AND SOCIAL SCIENCES

Fertility in time of economic crisis

The Great Recession effects on childbearing in the United States

Chiara Ludovica Comolli

Thesis submitted for assessment with a view to obtaining the degree of Doctor of Political and Social Sciences of the European University Institute

Florence, 27 April 2016

European University Institute
Department of Political and Social Sciences

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I confirm that chapter V was jointly co-authored with Prof. Fabrizio Bernardi and I contributed 60% of the work.

I confirm that chapter V draws upon an earlier article I published with Fabrizio Bernardi in the IZA Journal of Labor Economics 2015, 4(21), entitled "The causal effect of the Great Recession on childlessness of white American women”.

Statement of language correction:

This thesis has been corrected for linguistic and stylistic errors. I certify that I have checked and approved all language corrections, and that these have not affected the content of this work.

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ABSTRACT

This dissertation addresses the effects of the Great Recession on childbearing, focusing in particular on how economic and employment insecurity affects the transition to first birth in the United States. Chapter II offers an in-depth macro analysis of the effect of the Great Recession on fertility rates in the United States and in Europe. The chapter goes beyond the standard analysis of the relationship between unemployment rates and total fertility rates by using other macroeconomic indicators, such as public debt risk and an economic policy uncertainty index. Results show a strong negative correlation between such indicators and birth rates both in Europe and in the United States.

Chapters III and IV investigate micro-level childbearing dynamics in the US, and the mechanisms linking employment insecurity and the transition to first birth. They further address the link between macroeconomic indicators of the crisis and individual demographic behaviors. Chapter III shows that the probability of having the first child depends on couples' employment dynamic and that, compared to dual earners, all working status combinations are detrimental for childbearing, including those couples where women are housewives. The income effect seems to explain the results, while I find no evidence of an opportunity cost mechanism at play.

Chapter IV focuses on women and on the impact of intergenerational social mobility on the transition to the first birth. The findings confirm Easterlin's theory (1961, 1976) of resources and aspirations: during the crisis, American women become mothers earlier if they are socioeconomically non-downwardly mobile with respect to their parents.

Finally, this thesis shows a negative effect of the crisis on the extensive margin of fertility for women close to the limits of biological fertility. The latter is a crucial result related to the debate on the temporary versus permanent effect of business cycles' fluctuations on fertility. Chapter V studies childless women close to the end of their reproductive life, for whom any further birth postponement is likely to slide into permanent childlessness. The analysis is based on a novel research design implemented in order to go beyond the associational analysis. A difference-in-difference estimate, applied to pseudo-cohorts of childless White American women, identifies the (positive) causal effect of the Great Recession on permanent childlessness.

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CHAPTER I

INTRODUCTION

1. Introduction

> "More seems to be at work, however, than these mechanical forces - namely, a general feeling of uncertainty. Assessing the precise nature and effects of this uncertainty is essential, but it is not easy. […] Uncertainty appears more diffuse, more *Knightian* in nature. Worries about the ability of European policymakers to control the euro crisis and worries about the failure to date of U.S. policy makers to agree on a fiscal plan surely play an important role, but one that is hard to nail down."
>
> Olivier Blanchard[1]

A direct consequence of the rising levels of complexity in modern industrial societies is the emergence of new forms of risk (Chappe 2012). These are defined in the socio-economic literature as 'manufactured' risks because they are product of human activity, in comparison to natural risk, the only type that existed in preindustrial societies (Beck 1992; Giddens 1990).

According to the German Sociologist Ulrich Beck the central issue in modern society is the distribution of risk[2]. However, as the American economist Frank H. Knight (1921) pointed out, the risk framework is something very different from real uncertainty, under which the probabilistic calculus, the ability of assigning a probability distribution to future outcomes is impossible[3]. This is the kind of *Knightian* uncertainty also Olivier Blanchard referred to in the citation introducing this chapter, taken from his foreword to the International Monetary Fund (IMF) Outlook of 2012, where he talks about the Great Recession.

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[1] Foreword of the IMF Outlook of October 2012 (pp. XV).

[2] The concept of decision under risk is intrinsically linked to that of probability, in the sense that the actors behave according to a well-defined event space in which each decision is linked to a set of possible outcomes, each one associated with a known probability.

[3] It might be impossible to identify all the possible outcomes or, even if all outcomes are known, it might be impossible to attach probabilities to them.

While in this thesis I do not enter into the theoretical technical discrimination between risk and uncertainty, I find relevant for the theoretical line I follow in my investigation the broad argument that during highly uncertain circumstances it is necessary to look beyond the typical decision-making process.

Along the same lines, John Maynard Keynes (1937) argued that it is not always possible to assign a numerical value to probabilities and that many human decisions are driven by an 'animal spirit', namely attitudes and ideas led by psychological motivations that do not allow for a probabilistic calculus. Keynes went further, outlining three ways in which actors might deal with radical uncertainty in decision making: first, they might assume that the past is a guide to the future, secondly, they might assume that the market correctly anticipates the future, and third, actors tend to disregard their own judgment, favoring instead external judgment and conforming to the behavior of the majority[4].

Individuals are embedded in structures of social relationships and networks of people influencing and shaping - whether by constraint or persuasion - individual beliefs and actions (Montgomery and Casterline 1996). These networks might be limited to family or friends, or be much broader, encompassing the region, the country or the state of residence. Social interaction and the involved exchange of information, services and goods between individuals, is one of most powerful mechanisms explaining social behavior and shaping reproductive decisions (Montgomery and Casterline 1996, Rossier and Bernardi 2009). The literature on social interaction[5] is found across disciplines as diverse as sociology, economics, and cognitive and social psychology. Many of the concepts used in sociological theory derive from, and are deeply connected to, these other disciplines.[6]

Besides the theory of social interaction, the theoretical and methodological framework of the life course also emphasizes the embeddedness of the individual in a larger context. The focus of the life-course approach, in fact, centers on three main principles: first, that decisions are embedded in a cross-level array of social and personal factors; second, that each event in one domain of the life course is deeply interrelated with other life's dimensions; and third, that each event or decision is also interlinked to past life course events and decisions, as well as to the anticipation of the future

[4] Keynes continued predicting [for the individual subject to this uncertain conjuncture] the occurrence of sudden reversals of conduct, disillusions and breakdowns in beliefs and attitudes. He also cited two other interesting mechanisms for individuals to make decisions under uncertainty: reverting heavily to social norms or directing behavior towards avoiding severe harm.

[5] Some scholars refer to this literature as Diffusion Theory (or Diffusion Models) even though others link it more specifically to the Social Learning mechanism of social interaction.

[6] A large part of social interaction takes place within networks: relatively small groups within which individuals are embedded, to which individuals claim membership and make reference during the decision-making process. Networks affect individual behavior through their size, the characteristics of their members and their heterogeneity, the degree of intensity of the relationship between members, their density and power structure. The literature has identified three different mechanisms, albeit often overlapping, through which the network influences individual behavior: *social learning*, *social influence* and *social support*. The social support function of networks is self-explanatory – referring to the "informal exchange of goods and services between network members" (Rossier and Bernardi 2009:472).

Social learning refers to the mechanism of acquisition of information through social interaction, both explicitly (verbally) and implicitly (via observation). Kohler (2001) defines social learning as a mechanism of diffusion in which information about new technology or new ideas is extracted from the behavior of others. It is a general concept that includes not only personal networks but also other impersonal sources of social learning like mass media, markets, etc. Social learning is particularly relevant in cases of complex situations involving a great degree of uncertainty, during which a lack of information through usual means is replaced by the network's behavioral examples.

Social influence follows from the primary need to avoid intra-group differences (Montgomery and Casterline 1996: 155) and the human tendency to conform to shared practices so as to reinforce the individual sense of identity. This mechanism defines how individual behavior is constrained by consensus in the network group. Kohler (2001) describes social influence as encompassing the notions of conformity and endogenous change preferences induced by the behavior of others. In other words, the aggregate behavior modifies private incentives because preferences are endogenous to environmental influences. According to the author, social influence differs from social learning because in the latter information changes but neither preferences nor incentives do: holding information constant individual behavior is not affected by that of other community members. In the case of social influence, holding information constant, individual behavior might change according to the one prevalent in the group (Kohler 2001: 11-12).

consequences (Huinink and Kohli 2014: 1295). This is where the argument put forward by Keynes (1937) echoes.
As pointed out by the above-cited authors, an economic crisis and the uncertainty it generates might increase the influence that others' opinions have on one's own choices. Family and peer networks might become more important when individuals are unprepared to rationally evaluate present conditions, information, and future outcomes. In this thesis too couples and individual childbearing choices are evaluated throughout the analyses as embedded in the larger context of the multidimensionality and the cross-level character of those choices.

The recent economic and financial crisis represents the longest and strongest downturn that western economies have faced since the Great Depression of the thirties.
The Great Recession hit Europe a bit later and longer than the US, but its effects have been equally strong on both sides of the Atlantic. The financial roots of the crisis were the same and the consequences for the real economy have been – and in some European cases still are – dramatic. The crisis touched households at the very heart of their finances in all countries.
The starting event was an "orderly repricing of risk for assets linked to U.S. subprime mortgages" (Cardarelli et al. 2011: 80) that mounted by the summer of 2007 to a liquidity squeeze of the banking system when the assets became unsellable. The liquidity crisis generated doubts on the solvency of many financial institutions both in the US and in Western Europe.
The toxic assets backed subprime mortgage loans that enabled individuals in the United States with poor or no credentials to afford very high interest rates on their housing loans. These then found themselves unable to repay their debts and faced foreclosure. When the speculative housing bubble burst, the real estate market collapsed quickly and the owners saw house prices drop sharply, together with the values of their properties.
From the US, the European financial institutions in possession of the same illiquid assets got into trouble rapidly too. The banking sector in UK, Ireland, Denmark and Iceland were the most exposed to the subprime crisis and the most affected in 2008 by the initial phase of the financial crisis.

The consequences for the real economy in both the US and in Europe arrived soon, when the banking sector, in dramatic shortage of liquidity, stopped giving credit to individuals and firms. As a consequence, the latter, unable to borrow money, could not invest and hire. Internal and external demand plummeted and firms remained with large unsold stocks. To compensate for this, they had to fire employees and unemployment quickly reached unprecedented levels, especially among young adults with less experience on the labor market.
Unemployment reached 10% in the US in October 2009 and youth (young adults below 20 years of age) unemployment was at the time at more than 27%. In some European countries such as Greece

and Spain unemployment rates started to rise in 2008 and reached 25% in 2012. Production growth in 2009 plummeted at -5% both in the US and in Europe.
Governments, trying to save the financial sector and the economy, injected money into the banking sector, forcing their debts to grow so much that, as a spiral, the financial markets doubted that they could ever repay it. After an illusionary recover of the economies in 2010, in fact, the second phase of the Great Recession was characterized, especially in Europe, by the so-called sovereign debt crisis. Public debts grew so much that a governmental credibility crisis occurred. Interest rates on European sovereign debt skyrocketed, due to a speculative attack in countries like Greece, Spain, Ireland and Italy. The latter countries fell in a second period of negative GDP growth that, although milder, lasted a long time and dragged into recession the entire Eurozone until the first quarter of 2013[7].

This first introductory chapter illustrates the rationale and the main contributions of the investigation. The remainder of this chapter is structured as follows: Section 2 illustrates the research questions and the contribution of this thesis to the existing empirical evidence on the topic and Section 3 anticipates the main findings of the study. Section 4 outlines the methodology applied: why the Great Recession is an interesting case; the reasons for choosing the United States as a case study and the transition to the first child as the main outcome to explain. This section also briefly engages with a discussion on the different methods used in the analyses. Finally in Section 5 I conclude by illustrating the structure of this thesis.

[7] I do not go further in the narrative of the crisis since the major events and features of and the statistics concerning the Great Recession both in the US and in Europe are described in more details in Chapter II.

2. Research questions and main contributions

A great deal of research has been devoted to studying the impact of business cycles on fertility dynamics. Many theories were elaborated in the aftermath of the Great Depression of the thirties and in the following decades, describing whether and how childbearing behavior differs during economic booms and downturns. However, the evidence from the literature is still far from conclusive and the causal mechanisms through which the process operates have not been completely uncovered yet.
Economic uncertainty is a factor deemed as crucial in shaping childbearing decisions, but what kind of uncertainty? In which direction does it operate? What are the mechanisms at the basis of the relationship with fertility behavior? On which margins of fertility does it operate? These are some of the research questions I try to answer in this dissertation.

Economic uncertainty exists and affects childbearing behavior outside the periods of recession and severe financial and economic downturns too. Blossfeld and Mills (2003) argue that globalization creates social and economic uncertainty that is translated into economic, temporal and employment uncertainty for young adults facing the decision to start a new family. As they point out, "the increasing dynamics and volatility of outcomes of globalizing markets makes it more difficult for individuals, firms and governments to predict the future and to make choices between different alternatives and strategies. Increasing uncertainty about economic and social developments is therefore a definitive feature of globalization in advanced economies" (Blossfeld and Mills 2003:191).
The principal rationale of this thesis is to assess if something different happened to the childbearing response to the economic uncertainty generated by the Great Recession.
To put it briefly, the crucial issue I am here interested in is how aggregate financial and economic instability influences the micro-level perception of economic insecurity, and how this uncertainty generated in one domain of the life course, by economic or employment insecurity, spreads into non-pecuniary dimensions, shaping family-related life course events such as the entry into parenthood or the decision to remain childless. Note that in this thesis I refer alternatively to the transition to the first child as the transition to motherhood or parenthood.
The economic uncertainty created by the Great Recession concerns primarily individuals' present and anticipated future income streams, and their employment position. However, the individual dimension of insecurity is not the only one at play since even a person who is permanently employed but observes a high unemployment rate in her social network or in her country, may still perceive as relatively high the risk of future unemployment. In other words, even if one's own position is relatively safe, the mere fact of having a very large country-level unemployment rate, or of

experiencing unemployment through family, friends or colleagues might create a sense of insecurity strong enough to have an impact on consumption, investment and savings decisions. Perhaps this is even more true for those decisions that lie between the purely economic and the personal spheres such as whether or not to marry, to buy a house or rent it, and whether or not to have the first or an additional child. This first argument speaks in favor of a multiplicative negative effect of the aggregate conditions on micro-level insecurity.

On the other hand, being unemployed when many other people are as well might reduce the stigma and the psychological distress of unemployment and buffer the negative consequences on consumption, investment and saving decisions. This second argument speaks in favor of a moderating effect of the crisis on the negative impact of individual-level employment insecurity on those decisions.

This argument leads to one main cross-chapter research question driving the analyses in this thesis, especially regarding the micro-level investigations in the central chapters (III-IV):

> *RQ 1: How do aggregate and individual level economic and employment uncertainty interact to shape the transition to the first birth?*

While this research question is relevant, to some extent, to the whole study, the next research questions are singularly answered in each chapter. I now outline them, starting from the first empirical investigation, conducted in Chapter II.

Chapter II contributes to the existing literature on the relationship between business cycle fluctuations and aggregate fertility rates. The existing evidence on birth rate responses to the Great Recession has mainly focused on the pro-cyclical correlation between economic growth or unemployment rates, and fertility rates, during the early years of the crisis. Moreover, most studies look at the United States and Europe separately.

The main innovative features of my study are the following: first, I consider recent data that allows me to make a comparative analysis of the European and the American cases; and second, I look not only at the fertility response to unemployment increase during the Great Recession but I also investigate the effect of financial and economic policy uncertainty on births. To measure this uncertainty I use, first, an index of Economic Policy Uncertainty (EPU) created by three American professors, and, second, sovereign debt risk, measured in absolute terms with government bonds' yields and in relative terms *via* the spread between countries' bond yields and the German 'safe' bonds.

The purpose of this chapter is to test whether the perception of economic uncertainty is as influential as the objective circumstances of the economy (i.e. job market characteristics) on fertility. Despite being a fundamental issue, it has been rarely treated in the literature.

The main objective of this chapter is to define how sizeable the impact of the economic and financial crisis on fertility has been. To do so, I engage in a comparative analysis. Furthermore, describing the facts that characterized the crisis in the two regions helps explain the rationale for choosing the US for the micro-level the analyses. As illustrated later on, in fact, the impact of the crisis has been rather similar in Europe and in the US, but the financial and the real economy mechanisms at play have been instead quite different[8]. All this synthetically translates in the following research question (and sub-questions) to which Chapter II suggests an answer:

RQ 2: Is the recent decline in birth rates in the US and in Europe correlated to the onset of the Great Recession?

RQ 2.1: How large was the effect on birth rates in the US and in the European countries in comparative terms?

RQ 2.2: Which kind of aggregate economic and financial uncertainty generated by the Great Recession affected birth rates the most?

RQ 2.3: On which age groups and birth parities was the effect of the crisis concentrated?

An important contribution of this thesis is that I address, besides the embeddeddness of individual choice regarding fertility on the macro-level time-varying context (RQ 1 above), also the mechanisms of transmission of uncertainty between the different domains of work and family formation. These are the main determinants of the empirical investigations I conduct in Chapter III-IV. More precisely, Chapter III and IV focus on the transition to the first child and how the latter is affected by the employment instability generated by the Great Recession in the United States.

As mentioned, in both chapters I analyze the cross-level interplay between aggregate labor market conditions and household individual employment position; and I also rely for both chapters on the same American dataset, the Panel Survey of Income Dynamics (PSID).

However, the differences between the two are many. Chapter III investigates couples' employment, unemployment and non-employment dynamics; while in Chapter IV the focus is only on women, and in the analysis I investigate not only the employment/non-employment dynamic, but also the influence of intergenerational occupational mobility on motherhood, testing the Easterlin hypothesis of resources and aspirations. The research questions driving the investigation in Chapter III and IV are the following:

RQ 3: How does the couple's employment dynamic affect the probability of parenthood among childless couples in the US during the Great Recession?

[8] These considerations entail practical implications for my study in terms of the availability of data at the start of my PhD in 2011. Europe at the time was still dazed by the sovereign debt crisis and it was impossible to predict even the short-term individual-level consequences for fertility.

RQ 4: How does the intergenerational socioeconomic mobility of women impact on their transition to motherhood?

Chapters II-IV follow the demographic and sociological literature in their attempt to moderate the influence on unobserved heterogeneity in the estimates, by adopting well-suited statistical techniques (illustrated in the method section) to control for possible bias in the estimates of the effect of labor market conditions on fertility decisions. However, the findings of these first three empirical chapters are based on associational evidence and I cannot rule out the possibility that some unobserved couples' or individuals' characteristics bias my estimates by influencing both employment *and* fertility decisions. To make up for this, the last empirical - design-based - Chapter V is dedicated to the assessment of a causal effect of the Great Recession on the extensive margin of fertility, namely childlessness.

In addition, the results from the previous chapters suggest that the crisis does have a postponement effect on the transition to the first child but, from the available data, I cannot infer whether the delayed births would be recuperated or not, and whether the complete fertility of those women would be affected or not. This is the second purpose of Chapter V: assessing as precisely as possible whether there is a permanent effect of the Great Recession on births. The two purposes of the last empirical chapter are summarized in the following research question:

RQ 5: What is the causal and permanent effect of the Great Recession on first births in the United States?

On that note, I finally mention that Chapter V is an extension of an earlier paper co-authored with Fabrizio Bernardi (Comolli Bernardi 2015), entitled "The causal effect of the Great Recession on childlessness of White American women" and published in the IZA Journal of Labor Economics in November 2015.

3. Main findings

In line with the existing empirical evidence, my results (Chapter II) show that the crisis has depressed birth rates both in the US and in European countries. Also in line with the literature, I find that the largest negative aggregate effect was registered on first birth rates to very young women (below 25 years old). In contrast, among older women (35+) the aggregate negative effect seems to be larger on higher-order births compared to parity one.

The original findings of my study reveal that the increase in unemployment rates in Europe and the US has been responsible for more than the two-thirds of the average decline in the general fertility rate in those countries. However, although the elasticity of birth rates to unemployment is five-to-eight times larger than the elasticity of birth rates to financial uncertainty measures, the latter did have a substantial impact on the general fertility rates in the US and in Southern European countries.

These findings show that at the aggregate level we do witness a substantial reduction in births during the Great Recession, and that this decline strongly correlates with macroeconomic and financial indicators of the crisis. However, they do not reveal why this happens, namely the mechanisms that explain this fertility drop. Leaving the aggregate perspective and moving to an individual-level (one country) investigation, the purpose of the two central chapters of this thesis is to test some of the mechanisms identified by the literature.

More precisely, Chapter III and IV focus on the transition to the first child and how the latter is affected by the employment instability generated by the Great Recession in the United States.

The two chapters show common results. First, notwithstanding the strong correlation in the macro-level analysis conducted in Chapter II, aggregate unemployment rate *per se* seems not to be a good proxy in micro-level analyses of the negative impact of the Great Recession on first births. Second, my findings tend to exclude the possibility of any moderating effect of aggregate macroeconomic conditions, supporting instead the opposite hypothesis of a negative multiplicative effect of individual-level employment insecurity on the transition to the first child.

At the couple level, husband's unemployment reduces the probability of having the first child compared to dual earners couples, but even when he is employed, if the wife loses her job or leaves the labor force the likelihood of the first birth declines compared to dual earners.

For women (without considering the husband's occupation) the hazard of first birth is also larger for working immobile or upwardly mobile women, compared to the downwardly mobile. This confirms that the Easterlin mechanism of resources and aspirations is at play.

All in all, the two investigations in chapters III-IV suggest that the work and family dimensions are positively linked, and that reconciliation between the two domains seems not to be the main driver of postponement during the last decade – of intense financial and economic insecurity – in the US. As a matter of fact, couple's employment uncertainty and women's intergenerational downward mobility positively correlates to the postponement of parenthood.

Both chapters' analyses point to the same mechanism of transmission of insecurity from the working to the family domain, namely an income effect. The reduction in couples' (present and future) economic security due to either the husband's or the wife's job loss seems responsible for the postponement of childbearing during the Great Recession, with dual-earner couples being the most likely to have their first child. In contrast, neither of the analyses in Chapters III-IV supports the hypothesis that a reduction of the opportunity cost of childbearing arising from the job loss of one of the two partners speeds up the transition to parenthood.

Moreover, according to my findings employed women seem to take into consideration their socioeconomic aspirations (based on the status of their family of origin) before becoming mothers, as the Easterin Hypothesis would suggest.

Finally, as illustrated in the previous section, the purpose of the last empirical chapter (V) is slightly different and twofold: testing, first, the existence of a causal effect and, second, the existence of a permanent effect of the Great Recession on fertility. The difference-in-difference estimates suggest that the answer to both questions is affirmative: there is a permanent increase in cohort childlessness caused by the crisis in the US. The increase in the proportion of women around the age of 40 who remains childless due to the crisis is not very large, as expected from previous findings from the literature, but it is significant and, moreover, judging from the robustness checks conducted in Chapter V, I am fairly confident that those births have not be recuperated after the recession and we can label this decline in first births as a permanent consequence of the Great Recession on fertility.

A final major contribution of this last empirical chapter is the innovative and very flexible research design adopted for the analysis. The difference-in-difference approach applied to pseudo-panels of women has rarely been implemented in studies of fertility but it is very versatile and I show it can be helpful in situations where it is complicated to identify a suitable treatment/control comparison.

The quality of the contribution of Chapter V is witnessed by the fact that, as mentioned above, a reduced form of this chapter has been published in a peer reviewed journal (Comolli and Bernardi 2015).

4. Research design: case selection, data and methods

4.1 Why the United States?

Estimating in 2015[9] whether and how the ongoing economic and financial crisis will impact on fertility decisions might seem premature given that some countries in the Eurozone have not even recovered from the recession, and the American recovery appears much slower than expected. Moreover, the time interval between the treatment event (the crisis) and the outcome (fertility) under study is further expanded by the lag between financial and socio-economic events, the individual decision-making process and childbearing realizations.

On the one hand, the prompt timing of this investigation is a fundamental contribution of this thesis that enriches the literature on the topic of how economic uncertainty affects fertility behavior at the individual level. On the other hand, the quasi-simultaneity between the study and the event under study generates some problems.

This essentially explains the choice of the United States as my case study (and the fertility margins chosen as outcome variables illustrated in the next section).

The Business Cycle Dating Committee of the US National Bureau of Economic Research (NBER) officially dated the recession in the United States as beginning in December 2007 and ending in June 2009. After that, the recovery in the US was slow but solid, without further large drops in productivity, employment or financial stability. As mentioned in the previous section, instead, the Eurozone went through two very different phases of the Great Recession, where probably the latter (the sovereign debt crisis of 2011 and 2012) bore the largest consequences for households and family dynamics. However, only today, in 2015, was it possible to begin to analyze the latter.

A linked issue is that of data: the US offered high quality and recently updated data, compared to European countries. Regarding the latter, very good data were available for countries that were much less strongly affected by the recession, such as the Scandinavian countries or Germany, but not for the severely hit countries like Italy, Greece or Spain.

[9] I actually started the empirical investigation in 2011, when I started doctoral work at the EUI. At the time, Europe was still at the onset of the sovereign debt crisis and no outcome was predictable back then: the Greek exit from the Eurozone seemed a possible option, together with a reconfiguration of the European Union in term of fiscal or even political union. It was clearly complicated at the time to foreseen the fertility consequences of a crisis that was still very much going on.

The possibility to more clearly define a time horizon of the Great Recession, to set for it a date enough in the past to measure its consequences for fertility behavior at the individual level, and the quality of the data, are the three main reasons why I choose the US as a case study over Europe[10].

[10] For seek of completeness, though, the first empirical chapter (Ch. II) treating at the macro level the consequences of the recession for aggregate fertility, illustrates comparatively both the effects in the US and in the European countries.

4.2 The extensive margin of fertility: the transition to parenthood

Scholars' engagement with the issue of how economic crises affect the different margins of fertility has a long-standing history (Becker 1981; Easterlin 1961, 1976, 1980; Elder 1974; Ermisch 1988; Oppenheimer 1988, 1994; Oppenheimer et al 1997) and interest re-flourished in the aftermath of the recent Great Recession (Goldstein et al 2013; Kalmijn 2011; Morgan et al 2010, 2011; Schneider 2015; Sobotka et al 2011).

An important result of this literature is that business cycles can have a very heterogeneous effect across the different margins of fertility, such as the propensity to marry, the diffusion of marital separation, the probability of remaining childlessness or becoming parents for the first time, the propensity to have a second or higher-order births, and finally completed fertility of mothers.

Although recent descriptive macro-level studies document no acceleration in the early years of the crisis in the decline of marriages and divorces in the US (Morgan et al 2011; Cherlin 2013), previous studies showed that both tend to decline during recessions (Ahn and Mira 2001; Nobles and Buttenheim 2006; Prioux 2003) [11].

Empirical evidence also shows a heterogeneous impact of economic downturn on the extensive and intensive margins of fertility: first birth rates, especially among young adults, tend to be pro-cyclically correlated to macroeconomic aggregates, while the latter affect the fertility of mothers (parities higher than one[12]) to a lesser degree (Cherlin 2013; Goldstein 2013; Morgan et al 2011; Neels 2010; Schenider 2015; Sobotka et al 2011). Finally, childlessness rates also tend to rise during periods of economic uncertainty (Morgan 1991).

As also mentioned in the last section on the case study selection, the investigation of the long-term impact of the crisis on fertility trends goes beyond the scope of this study, which was conducted right after the end of the recession in the United States. For this reason I could for instance not embark on the ambitious endeavor of measuring the effect of the Great Recession on completed fertility; this will be possible only when the cohorts of women who experienced the economic downturn reach the end of their reproductive years.

Therefore, to reach the main objective of this thesis, that is to uncover some of the mechanisms of transmission of the economic and employment uncertainty generated by the Great Recession to the family domain, I have to narrow down the fertility outcome that I am looking at, renouncing the broader picture of the different margins of fertility (from marriage to higher births parities) and concentrating on only one outcome, namely the transition to parenthood. In other words, I preferred to

[11] Eurostat statistics also show for Europe that the decline in marriage started decades ago and do not show any acceleration since 2009. Divorce rate in the European Union is stable around 2 per 1000 individuals since the mid-2000s (Eurostat 2015).

[12] Note that by 'fertility of mother' I hereby refer to second or higher-order births, as opposed to first births to childless women.

widen the range of my explanatory independent variables (using different measures of economic and employment insecurity) than to widen the range of my dependent variables (fertility behavior at different parities).

As said, this restriction allows me to devote more effort to designing my explanatory variables and to going deeper into the mechanisms of the nexus between economic and employment uncertainty and the transition to parenthood, which clearly differ a great deal from the mechanisms linking insecurity to higher-order births. As will be illustrated in greater detail in the next chapters, individual-level empirical findings tend to point to a negative effect of economic and employment uncertainty on first births (Blossfeld and Huinink 1991; Neels 2010; Neels, Theunynck and Wood 2013; Lange et al. 2014). The effects on higher parities are less investigated in the literature but most studies find a negative smaller, or null, impact on the second while finding a substantial negative effect on the probability of having a third child after the husband's job loss (Heckman and Walker 1990; Amialchuck 2013). The decision to have a second or third child might be less affected by economic uncertainty because parents enjoy economies of scale after the first child, and the difference between the second and third child might be explained by the diffused social norm of the two children.
Parenthood instead implies a life-changing transition that is intrinsically different from moving to higher-order birth parities. The larger negative effect of economic and employment insecurity on this transitions might be explained by the fact the together with the negative *income* effect, there is also a negative *affordability* mechanism (Oppenheimer 1988; Rindfuss and VandenHeuvel 1990) at play in the transition to parenthood. Young couples might think that having a rewarding career and a stable income is a precondition to becoming parents and postpone childbearing until they have established this solid position. The latter are some of the mechanisms that I empirically test in Chapters III and IV of the thesis.

Finally, in this thesis I do not only look at the probability of parenthood; I also investigate the 'complementary' probability that women end up never having children due to the Great Recession.
What, in fact, appears to be a crucial point in the debate on the consequences of economic uncertainty on fertility is *time*: I realized that more research is needed to address whether economic shocks impell women to only temporarily postpone marriage and births, or whether this postponement also depresses the total number of children women have. Chapter V contributes to these crucial issue in the literature, focusing on the permanent causal effect of the Great Recession on childlessness.
Permanent childlessness has important implications at the societal level and for policy purposes too. First, rising rates of childlessness have demographic implications such as declining aggregate fertility rates in advanced societies that already face the challenge of population decline. These changes in the population structure bear crucial economic implications such as an increase in the dependency ratio, burdening public spending. Another argument put forward in the literature on the justification of

public support for individual fertility choices is that having children increases individual welfare (Bernardi 2005). The child gap, the difference between the desired and the actual number of children women have, would measure a sort of a welfare deficit worth of public interest. Bernardi (2005) shows for Spain that this child gap is mostly concentrated on childless couples. According to the welfare deficit argument, therefore, childless couples that would like to have a child, but for some reason cannot, represent a large public policy concern and welfare cost.

Finally, old individuals have been shown to have an increased likelihood of social isolation (Bachrach 1980; Koropeckyj-Cox and Call 2007; Connidis 2010) and institutionalization (Rowland 1998) if they are childless.

These are some of the many reasons justifying the importance of investigating the determinants of childlessness and the transition to the first birth, among which, the economic determinants are clearly crucial.

4.3 Data and Methods

The four empirical chapters of this thesis (II-V) follow a similar rationale of explaining the reaction to the Great Recession of first births and childlessness rates. Although each chapter makes use of a different quantitative method to reach this purpose, there is a sort of methodological circularity to the study: from the macro-level broader and comparative perspective of Chapter II, I move to the micro-level in-depth study of one country (the United States) and one dataset (PSID) in Chapter III and IV, first investigating the couple-level (Ch. III) and then the womens' (Ch. IV) perspective, and finally I go back to an aggregate cohort approach to study childlessness.

Chapter II consists of a macro-level study of the impact of the Great Recession on fertility rates in advanced economies, i.e. the US and Europe, to contextualize the investigations at the micro-level conducted in the following chapters of this thesis.

The analysis starts from a recent study by Goldstein, Kreyenfeld, Jasilioniene and Orsal published in 2013 in which they investigate the role of rising unemployment in Europe in the decline in births in the period 2001-2011. My analyses depart from this study in the following ways: first, I enlarge the sample to include more countries and more recent data; second, I do not only look at the effect of unemployment on fertility rates but I also include measures of financial and economic uncertainty such as long-term sovereign bond yields and the Economic Policy Uncertainty (EPU) Index. Finally, I also complement the analysis exploiting the monthly variation in the dependent and independent variables.

Besides consisting of a macro-level investigation, there is a further important remark to be mentioned on the distinctive character of this first chapter with respect to the following, namely that it analyzes comparatively the impact of the Great Recession on fertility in the US and in European countries, while afterwards I will focus only on the American case.

The investigation is clearly descriptive but I try as much as possible to control for time trends, country time-invariant characteristics and country-specific time trends in fertility (and seasonality of births in the monthly analysis).

As mentioned, Chapter III is the first micro-level investigation of the mechanisms for transmission of economic and employment uncertainty on the transition to the first birth. Using a panel fixed effects model on the Panel Survey of Income Dynamics (PSID), the analysis tests the existence of an interaction effect between couples-level employment status conditions and aggregate macro-economic circumstances, represented by US states' aggregate unemployment rates. The couple's fixed effect guarantees that the final estimates are net of couples' time-invariant unobserved characteristics that influence both employment conditions and fertility decisions. Important unobservables are couples' attitudes toward childbearing, career motivation and ability. The non-explicit underlying assumptions of this couples' fixed effect model are, first, assortative mating, namely that partners select themselves based on those similar characteristics (usually attitudes and preferences towards work and family; educational level etc.) and, second, that these characteristics are constant over time.

The method of estimation is a linear probability model (LPM) of the probability that couples have their first child. The advantage of this method is simplicity and a more straightforward interpretation of the estimates than a more complicated estimation method (e.g., Conditional Logit) would allow. In LPM, in fact, implementation and interpretation is relatively easy, the sample size does not shrink during estimation and the model is more robust to different specifications. Moreover, the logit marginal effects equal the LPM estimates in the cross-sectional setting. For this reason, the preference for the LPM compared to non-linear models in the literature is non-negligible (Currie and Gruber 1996; Fairlie and Sundstrom 1999; McGarry 2000; Angrist 2001, 2008). More details regarding the choice of this model are provided in the method section in Chapter III.

A disadvantage of modeling the transition to parenthood with a panel fixed effect of the probability 0/1 of having the first child is that this model does not explicitly consider the postponement effect of the crisis on parenthood. The best way in fact to model transitions is through Event History Analysis (EHA) which models the risk of first birth in terms of the instantaneous survival probability to the specific event of childbearing.

The Cox Proportional Hazard is the method, in fact, used in Chapter IV where I investigate the effect of employment insecurity during the Great Recession on the risk of motherhood for women. This specific model allows me to further investigate the effect of time, varying occupational spells on the transition to the first child and taking into consideration the duration of each spell. Specifically, in Chapter IV I analyze both the impact of non-working versus working time spells and the effect of intergenerational socioeconomically mobile job spells of women (with respect to their parents) on the hazard of first birth.

The model becomes clearly more complex (non-linear) with respect to the panel data of the previous chapter and it becomes more difficult to comment on the magnitude of the effects and on the interaction terms. However, first, this time-varying EHA method more efficiently exploits the detailed occupational information provided by the PSID dataset and more accurately models the transition to the first child, and second, as I argue in Chapter IV, the results of the analysis are still generally comparable to those of Chapter III.

An additional purpose of this thesis is to address the causal link between the crisis and fertility more specifically, in the attempt to moderate the effect of the unobserved heterogeneity that plagues the majority of the studies on this topic[13]. The statistical methods applied in Chapters II-IV, in fact, are useful to control for unobserved characteristics of states, couples or individuals, that might influence simultaneously employment conditions and fertility behavior, but only if those characteristics do not vary over time. Appling these methods, and controlling for as many as possible observed variables that might influence the causal path, does not guarantee that the final estimates are entirely free of bias and truly estimate the causal effect of the recession on childbearing.

To do that, a study needs to rely on the randomization of the treatment that in this case means that couples or individuals should be randomly assigned to the Great Recession, and this is clearly not feasible. As the section on identification strategy in Chapter V illustrates in details, to circumvent this problem, I use a slight variation of the difference-in-difference approach applied to pseudo-cohorts (Comolli and Bernardi 2015).

Instead of comparing a treatment and control group across space (and time), I compare them across birth cohorts by contrasting the childlessness rates among women whose last reproductive years coincided with the Great Recession, to childless women who spend those same years in the period just before the onset of the crisis. The year of birth is randomly assigned and the identification of the causal effect of the recession on childlessness relies on the fact that these two groups of women differ only in the fact that the first are treated (were in their late thirties during the Great Recession) and the second are not. Chapter V justifies empirically why this is the case, first, comparing descriptively the two groups on the main determinants of fertility behavior, and second, by testing graphically the parallel trend assumption and third by conducting a set of robustness checks on the final estimates. Among the latter, it is worthwhile mentioning that the analysis has been replicated on two different datasets from the American census, the America Community Survey and the June Fertility Supplement of the Current Population Survey. The two datasets slightly differ in the way the question about the number of children is posed; therefore, showing that the results are robust across the different datasets is a very important contribution of this analysis. Replication is an extremely important asset of empirical research to robustly validate findings even though it is unfortunately a not very diffused practice in the literature yet.

[13] And that could also bias the estimates in my micro-level analyses in Chapters III-IV, if these unobserved variables affecting both occupational conditions and fertility decisions, vary over time.

5. The structure of the thesis

After the present introductory first chapter outlining the main research questions, contributions and findings of this study, the thesis is composed of four main empirical chapters (II-V). At the cost of some repetition I hereby conclude this chapter briefly summarizing the content of the next chapters.

The first empirical chapter, Chapter II, is a macro-level investigation with two main purposes: it first presents a description of the events and facts related to the Great Recession in the US and in Europe. The second purpose of Chapter II is to correlate these facts to the evident decline in aggregate fertility rates in western countries, comparatively in the US and in European countries.

The two central chapters move from the aggregate to the individual level to analyze closer the fertility response to the crisis, and in particular to the labor market insecurity generated in the US after 2008. Chapter III engages with the mechanisms of transmission of insecurity from the employment domain to the transition to the first child. The focus of this chapter is on childless *couples* and their probability of entering into parenthood, conditional on the couple's combination of employment status and on the aggregate conditions of the US state in which they reside.

Chapter IV focuses on childless *women*, instead of couples, and analyzes their fertility behavior in response to the crisis through the lens of the Easterlin Hypothesis of relative socio-economic status. The purpose of this fourth chapter is to test the effect on the transition to first birth, of women's intergenerational occupational mobility, before and during the Great Recession.

The last empirical chapter, Chapter V, abandons the couple- and individual-level perspective and goes back to the macro-level, adopting a cohort approach to investigate the existence of a permanent causal nexus between the Great Recession and the renunciation of motherhood among childless women around the age of 40. Using a more design-based approach to US census data, Chapter V shows that the proportion of White American women close to the end of their reproductive lives remaining childless due to the Great Recession increased. Note that Chapter V, as already mentioned, is an extended version of a co-authored paper published with Fabrizio Bernardi in November 2015 (Comolli and Bernardi 2015). Finally, Chapter VI concludes this dissertation by summing up the most relevant results, highlighting the main caveats of the analyses and giving some insights for implications and future research on the topic.

CHAPTER II

THE FERTILITY RESPONSE TO THE GREAT RECESSION IN EUROPE AND THE UNITED STATES.
OBJECTIVE ECONOMIC CONDITIONS AND PERCEIVED ECONOMIC UNCERTAINTY.

1. Introduction

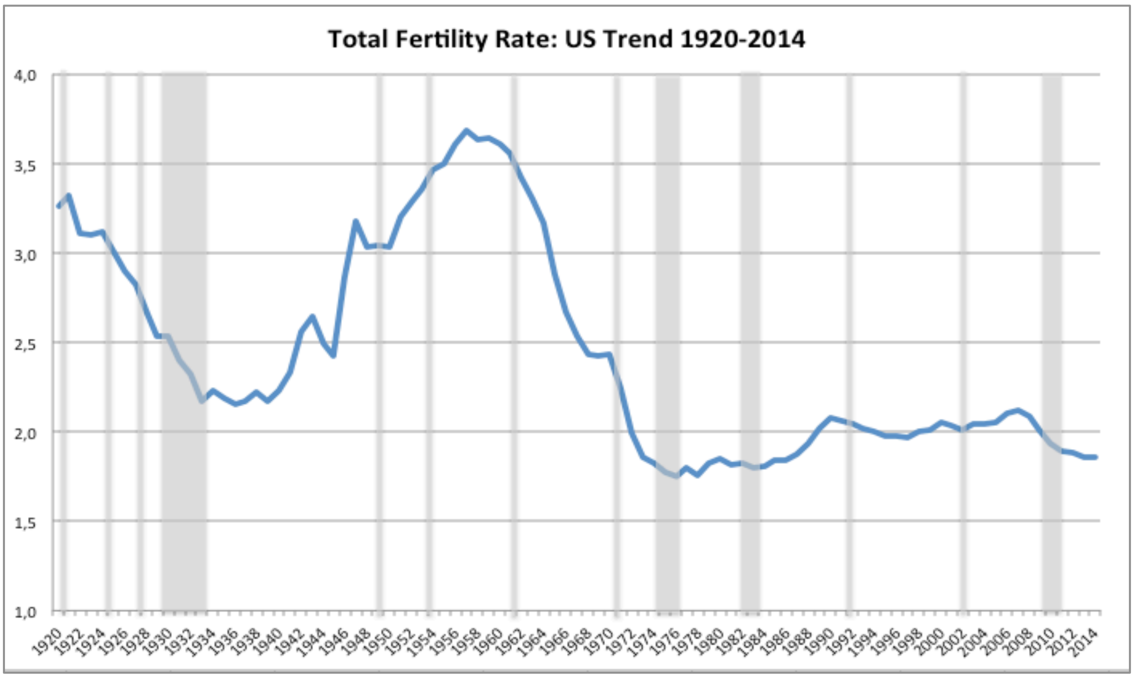
Literature and evidence repeatedly suggest the existence at the aggregate level of a pro-cyclical relationship between fertility behavior and economic growth, having characterized developed societies on completion of the Demographic Transition, from the XX century onward. Periods of economic depression were characterized by, generally temporary, downturns in fertility, followed by more prosperous intervals when fertility was recuperated. At the aggregate level this holds true for the vast majority of the XX century financial and economic crises (e.g. the Great Depression of 1929, the oil shock-induced recession of the mid-seventies, the US stock market crash of 1987, the Scandinavian banking crises of the early nineties in Europe, and the post-communist crisis in Central and Eastern European countries). All these events, albeit very differently and for various reasons, brought about a reduction, more or less pronounced, of fertility. However, the impact of economic depressions on fertility rates is normally rather small and of short duration because such socio-economic factors are relatively short-term compared to secular demographic trends (Lee 2003; Lesthaeghe 2010). The former are generally adumbrated by long-term fertility tendencies, so that the final number of children that women will have at the end of their reproductive life is seldom affected. All the economic recessions of the XX century had only a temporary and small impact on fertility rates, because all of them occurred in a context of long-term fertility decline that was only partially accelerated by economic hardship (Lee 1987, 1997, 2003; Morgan et al. 2011, 2012; Sobotka et al. 2010, 2011).
Looking at the long time trend of Total Fertility Rate (TFR) – the most commonly used period

measure of aggregate fertility[14] – in the US since 1920, illustrated in Figure 2.1, it is evident that periods of economic recession, highlighted with vertical bars, had only a small and temporary effect on birth rates compared to the large dips in fertility that characterized the inter-war period and the two decades of the sixties and seventies. Societal changes, access to contraceptive measures and cultural revolutions clearly have a determinant long-lasting impact on childbearing behavior, and economic downturn might only accelerate an existing negative trend in fertility, or halt a positive trend.

As Kreyenfeld et al. (2012) argue the effect of macroeconomic conditions on fertility is all but uniform, being heterogeneous across crisis-events (and also countries and individual life-stages).
Compared to the three previous recession episodes[15] that have been followed by a drop in the TFR of a maximum of 0.06, the fertility decline during the Great Recession has been stronger (-0.26 between 2007 and 2014[16]) and it has lasted longer.
The most frequently cited comparison in the interpretation of the potential consequences of the Great Recession of 2007-2009, though, is the Great Depression of the thirties, which had strong negative effects for fertility, even if a large part of the drop in the TFR (the total decline in the fertility rate was -0.36 between 1929 and 1937) was due to the postponement of births. However, at that time the postponement lasted long enough to generate a cohort of 'children of the Great Depression' (Elder 1974) of extraordinarily small size entering adulthood in the forties and fifties, and stimulating interest in the research of fertility cycles (Cherlin et al. 2013; Easterlin 1961, 1976, 1980).

[14] The total fertility rate (TFR) is the average number of children born to a woman over her lifetime, if she were to experience the current age-specific fertility rates (ASFR) through her lifetime, and if she were to survive from birth to the end of her reproductive life. It might be understood as the expected number of births under the assumption that the age specific rates don't change over time. The TFR is a period rate biased by a tempo effect, because it doesn't consider changes in the mean age at childbearing. Therefore it systematically underestimates fertility in times of postponement of childbearing, and overestimates it in times of anticipation of childbearing.
[15] The 'Double-dip' recession of 1980-82 driven by the contractionary monetary policy adopted in the US to combat high inflation; the recession of the early nineties due to the US junk bond market collapse and the Scandinavian banking crisis; and finally the 2000-2001 one induced by the burst of the dot-com bubble and the 9/11 attacks.
[16] 2014 are the last available estimates at the time of writing.

Figure 2.1: Total Fertility Rate in US (1920-2014).



Source: Elaboration of the author based on data from US National Center for Health Statistics. Social Security Administration 1997 for data 1920-1980.

Only to scratch the surface of the analogy, a first remarkable difference between the two economic crises concerns the very different historical trends, and the related levels of fertility, during which they took place. The 1929 crash happened during a decline in fertility already ongoing for two decades, due to the advent of the first birth-control movement that promoted family planning among married couples to space children and reduce family size[17] (Dawson et al. 1980; Wardell 1980); however the Great Depression also happened during an historical period where TFR was well above 2.5 children per women. In contrast, the Great Recession hit the US, as it did the rest of the western countries, during an extended period (lasting more than two decades) of stagnation of fertility at exceptionally low historical levels. Actually, the first years of the 2000s were characterized by a moderate, but diffused rise in birth rates that was abruptly halted by the onset of the economic and financial crisis of 2007.

The aim of this first empirical chapter is to contribute to the evidence of aggregate-level studies of the impact of the Great Recession on fertility rates in advanced economies, and to contextualize the investigations at the micro-level conducted in the following chapters of this thesis. The analytical section of this chapter starts from a recent study by Goldstein and colleagues (2013) in which they investigate the role of rising unemployment in Europe in the decline in births during the first decade of the XXI century. With respect to their paper, the innovative features of the present

[17] The second wave of birth control begun in 1960 with the diffusion of modern contraception methods like the birth control pill and intrauterine devices (IUD).

study are numerous: first, I enlarge the sample to include more countries and more recent data; second, I do not only look at the effect of unemployment on fertility rates, but also include measures of financial and economic uncertainty such as long-term sovereign bond yields and the Economic Policy Uncertainty (EPU) Index (see Section 2.3 for an in-depth description).

The specific aim of this chapter is to assess whether these latter indicators of the perception of economic uncertainty are as relevant in influencing fertility as structural objective circumstances of the economy, such as job market conditions. This crucial issue has been rarely treated in the literature of aggregate studies of fertility and business cycles.

Finally, I complement the analysis exploiting the monthly variation in the dependent and independent variables. The monthly variation is likely to be less determinant for unemployment rates that vary to a lesser extent on a month-to-month basis, but it is crucial for the measures of financial and economic insecurity that vary with a higher frequency, often on a daily basis.

Besides consisting of a macro-level investigation, there is a further important remark to be mentioned on the distinctive character of this chapter with respect to the following, namely that it analyses comparatively the impact of the Great Recession on fertility in the US and in European countries, while afterwards I will focus only on the American case.

The rationale for doing this is twofold: first, the scope of this first empirical chapter is to *qualify* and *quantify* the object under study in this dissertation, namely of which kind and how sizeable has been the impact of the economic and financial crisis on fertility. Therefore, I think that to better grasp the scope and the magnitude of such an effect, the analysis should be done in comparative terms. Second, having a complete picture of the circumstances in the two regions serves as an explanation for why at the micro-level the analyses have been conducted on the US. As will be soon clarified, in fact, while the strength of the crisis has been similar in Europe and in the US, the financial and the real economy mechanisms at play have been rather different. This is all the more so if we consider the large variation within Europe of the impact and the consequences of the Great Recession. These considerations entail practical implications for my study in terms of the availability of data at the start of my PhD in 2011. Europe at the time was still in a daze from the sovereign debt crisis and it was impossible to predict even the short-term individual level consequences for fertility. On a final note, the empirical research that I will cite in the backdrop of all my analyses was conducted in both Europe and the US, another reason for not leaving European countries completely out of the picture.

The analysis is conducted starting from a sample of about thirty European countries plus the US. I use different financial and macroeconomic indicators that proxy the onset and the escalation of the recession, to study their impact on birth rates in the period 2003-2013. However, before conducting the analysis it is useful to review the main facts and events pertaining to the unfolding of the Great Recession. A detailed timeline of the financial and economic meltdown would serve as a reference frame for the rigorous analysis later on, in this and in the following chapters, when the explanatory variable of the model (the recession) is operationalized through macroeconomic and financial indicators. The narrative of the Great Recession starts from the American case where the financial turmoil originated (and the case study of Chapters III-V of this thesis); and then, for the sakes of comparison and completeness, I will briefly describe the main events in the Eurozone.

After this brief introduction the chapter is structured as follows: Section 2 illustrates the main economic and financial events that characterized the recession in the US and in Europe and the trend in the last ten-to-fifteen years of the main financial and macroeconomic measures that I will use later in the analyses as explanatory variables. Section 3 shows the tendency in fertility in the period across the Great Recession years, while Section 4 describes how this study fits into the existing literature and the evidence on the impact of business cycles on fertility. In Sections 5 and 6 the main analyses of the effect of macroeconomic and financial indicators on yearly and monthly birth rates are conducted. Finally, Section 7 draws the conclusions.

2. The Great Recession in the United States and the Eurozone

2.1. The financial turmoil in the United States

Driven by the burst of the housing bubble that had topped in 2005-06, the US subprime mortgage crisis of 2007 was characterized by a series of negative events that took place in late summer and autumn of that year: the collapse of the Bear Stearns Hedge Funds in June 2007 followed by the losses registered by major Wall Street firms which had loaned the firm's money, like JP Morgan Chase, Citigroup, Goldman Sachs and Merril Lynch.

Hereafter the emergence of subprime losses exposed other risky loans and, with a domino effect, those losses mounted and panic diffused into the inter-bank loan market. One year later, at the beginning of September 2008, Fannie Mae (Federal National Mortgage Association) and Freddy Mac (Federal Home Loan Mortgage Corporation), two of the largest government sponsored financial enterprises underwriting home mortgages, were put into government conservatorship, and on 15th September 2008 Lehman Brothers went bankrupt. The 18th of September the Treasury Secretary Henry Paulson and the Federal Reserve Board Chairman Ben Bernanke proposed a $700 billion plan to stabilize the US financial system (which failed to pass in the Congress the following 29th September but was finally approved one week later). The New York Times reported[18] what would become one of the most famous statements of the crisis: "If we don't do this," Mr. Bernanke said according to the several participants to the night meeting in which the rescue plan was presented, "we may not have an economy on Monday." On the 25th of September the largest savings and loans American association, the Washington Mutual Bank, closed down, and seven days later, during the first week of October 2008 the DJIA (Dow Jones Industrial Average) lost 18.15 percentage points, registering its all-time worst weekly performance.

The Business Cycle Dating Committee of the US National Bureau of Economic Research (NBER) declared that the recession in the United States began in December 2007 and ended in June 2009. US demand had been shrinking for five consecutive quarters at the pace of -2.6% per quarter at annual rate. The Real Gross domestic Product (GDP) began contracting in the third quarter of 2008, reaching almost -5% in 2009 with respect to 2008; capital investment reached post-war levels in the first quarter of 2009, and residential investment dipped more than 23% lower than the year before. The

[18] Sorkin, Henriques, Andrews, and Nocera. *As Credit Crisis Spiraled, Alarm Led to Action*. New York Times. Published October 1 2008.

housing market was hit by a large drop in house prices and a boost in the rate of defaults and foreclosures (the total number of home foreclosures in 2008/2011 was 14.1 million, compared to the 3.2 million of the years 2004/2007[19]), with ownership rates consequently falling from 69% in 2004 to 66.4% in 2011 (CPS)[20]. The number of new privately owned housing units authorized declined from more than 2 million in 2005 to 600 thousands in 2010. Between 2006 and 2008, America's second largest household's asset, total retirement assets, dropped 22%, savings and investment assets lost $1.2 trillion and pension assets lost $1.3 trillion (Altman 2009).

According to the US Security and Exchange Commission (SEC)[21], between June 2007 and November 2008 Americans lost an estimated average of more than a quarter of their collective net worth.[22] Income levels had dropped so much that the median male worker was earning, on an inflation-adjusted basis, in 2010 less than in 1968 (Census Report of Income data). The unemployment rate – traditionally quite low in the US, around 4-6% between 2000 and 2008 – had almost reached the high levels of the early 80s recession: peaking at 10% in October 2009 (Bureau of Labor Statistics data) and remaining above 8% until mid-2012.

The economic turmoil also accentuated income inequality, increasing the concentration of wealth at the top of the income distribution, at the expense of the middle class, the poor and the younger generations. The middle class income share fell from 62% in the seventies to 45% in 2011, while that of the upper class went from 29% to 46% (Taylor 2012)[23]. The intergenerational economic gap grew too: individuals below 35 years old are 68% less wealthy than they were in 1984, while in the same period those over 55 have become 10% wealthier[24].

The financial meltdown also brought about substantial consequences for the public finances of the US government, which had to face a dramatic increase in public deficit, with repercussions on the ability of the states to repay their debt. A political debate started in the summer of 2011 concerning the necessity to increase the debt ceiling[25], which had a large negative effect on public support for the US government. President Obama signed the Budget Control Act on the 2nd of August 2011 according to which the borrowing limits were expanded and public expenditure was reduced. In response, several days later S&P downgraded the credit rating of US bonds for the first time in history, and international markets went through the most volatile week since the start of the crisis (the DJIA suffered a 5.6% loss in one day). The new debt ceiling approved in 2011, of $16.4 trillion, was reached by the US

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[19] RealtyTrac, Federal Reserve, Equifax through http://www.statisticbrain.com/home-foreclosure-statistics/.

[20] Current Population Survey – Housing Vacancies and Homeownership.

[21] The Security and Exchange Commission is an independent federal agency established pursuant to the Securities Exchange Act of 1934, in the aftermath of the Great Depression. Its aim is to regulate capital markets, protect investors, and maintain fair and efficient markets, enforce security laws and monitor the stock exchange.

[22] http://www.sec.gov/about/secstratplan1015.pdf.

[23] http://www.pewsocialtrends.org/2012/08/22/the-lost-decade-of-the-middle-class/?utm_expid=53098246-2.Lly4CFSVQG2lphsg-KopIg.0

[24] Taking into account also the steep increase in college expenses.

[25] The debt ceiling is a cap set by the US Congress on the amount of money the federal government may borrow. The limit applies to debt owed to the public (i.e. anyone who buys U.S. bonds) plus debt that the Treasury owes to government trust funds such as those for Social Security and Medicare. The Republicans are in favor of the ceiling as they claim it puts a limit on government spending, but in the end the ceiling refers to obligations that have already been incurred, not to new ones.

government the 31st December 2012, the date on which the Treasury Department allowed 'extraordinary measures' to allow the federal government to keep paying its bills[26].

The Great Recession left American households with a huge debt and the economy with a large and durable loss in output and employment. Total debt is high (375% of GDP in April 2009 to 343% of GDP in the third quarter of 2013: Federal Reserve, Bureau of Economic Analysis[27]) due to non-financial private debt that is very large. Household debt has gone back to pre-crisis levels but is still substantial (98% of GDP in the last quarter of 2009 and 80% in mid-2014). The general deleveraging of the private sector has been possible only by an increase in the public debt: Government debt went from around 62% in the third quarter of 2007 to more than 103% at the beginning of 2014, hitting the 100% threshold already at the end of 2012. Mortgages delinquency rates (loans more than a month past due) increased from 2% at the beginning of 2007 to 11.3% in the first quarter of 2010 to return to 7% in the third quarter of 2014 (residential private loans). However, more than five years after the crisis a significant proportion of mortgage holders are still 'under water' meaning that the difference between what they owe and the current value of their houses is positive and substantial.

In December 2014 the unemployment rate was 5.6% (down from the 10% of October 2009) even though part of the recuperation is due to the decline in labor force participation (down to 63% today, from 66% before the crisis). The rest of the recovery in employment is due to the private sector (especially jobs with low wages, minimal benefits, short hours and erratic schedules in sectors like retail, food service and personal care) since public jobs have constantly declined in the last four years. Long-term unemployment remains a problem compared to pre-crisis levels: if in 2007 the median duration out of the labor market was of 7-8 weeks, after peaking at 25 weeks in 2010, today it is still around 16 weeks of unemployment (OECD 2014 US Report). Moreover, exiting unemployment is not easy even if a person has been non-working for a short time: only 15% of the unemployed have, one year later, a steady full-time job. Moreover, the share of workers who have a (involuntary) part-time job due to economic reasons are today still almost double (5%) that of 2007.

Finally, in the US, as much as in Europe, the burden of unemployment fell on the younger generations: in October 2009 27.2% of 16-19 years old adolescents (out of compulsory education[28]) didn't have a job (20.7% today), while among the 20-24 year olds that percentage reached 17.2% in

[26] After months of debates around the issue, another similar budget impasse happened in October 2013 when the US federal government shut down for two weeks due to a funding gap (neither a legislation appropriating funds for fiscal year 2014 nor a continuing resolution of the temporary authorization of appropriations for fiscal year 2104 were enacted on time), created by the failure of agreement between the two chambers of the Congress. At the center of the disagreement between Democrats and Republicans that led to the budget impasse was basically the Patient Protection and Affordable Care Act (*Obamacare*) and the attempt to delay it made by the Republicans, coupled with a long-standing political disagreement on the increase or abolition of the debt ceiling. In February 2014 the debt ceiling was suspended without conditions through March 2015.

[27] Data gathered by the report by Schwenninger and Sherraden for the Economic Growth Program of the New America Foundation (March 2014). The New America Foundation is a nonprofit, nonpartisan public policy institute that invests in new thinkers and new ideas to address the next generation of challenges facing the United States; and the St. Louis Fed.

[28] Compulsory school attendance in the US varies by state. The ending age varies around 16-18 years old or, if happening before, the completion of secondary school. Some states allow for early leave with parental approval, or they allow for education outside the school and conducted at home. Other students may be exempted from completing compulsory education if they meet specific requirements: for instance, New York City and Buffalo require attendance until 17 unless students are employed, in which case they can leave before that age (National Center for Education Statistics IES, 2008 statistics).

April 2010 (11.9% today). In 1996, the same age-specific unemployment rates were 16.7% and 9.3% respectively (BLS). As a consequence, young adults (below 25 years old) find it much harder today then ten years ago to establish their own independent households and either they move back (or stay) with their parents, or they go back to studying (the share of student loans in total private debt has increased sharply).

Real wages are stable (or declining) and households' median income is steadily decreasing since the crisis has started. Consumption is still high while savings and investment are not growing enough (both private and public). Even though housing prices are slowly recovering, the number of first-home buyers is still low due to unemployment.

Inequality has never been so large in US: the top 1% of the income distribution between 2009 and 2012 has captured the 95% of the increase in national income. The richer strata are the drivers of the recovery: their consumption has increased by 12% in 2007-2012 while for the households in the last 95% it has decreased by 2% in the same period.

According to OECD estimates, in 2010, 12% of the households with at least one working member experienced in-work relative poverty, while 8% of those with all adults working were in poverty. The estimated total number of people in poverty is of 12 million (Council of Economic Advisers (CEA), 2014)[29].

[29] Six years after the onset of the Great Recession the US economy has started to pull itself back together. The banking sector has returned to health, the stock market has reached new heights, the real estate market is recovering and housing prices are rising, unemployment rates have fallen and economic growth is restored together with consumer confidence. However, the upswing has been slower than expected and the economic and social consequences of the recession are far from forgotten. Many Americans are still struggling with increasing inequality, the costs of mortgages higher than real house values, the stuck of real incomes and the high cost of healthcare and education.

Moreover, the recovery of the real economy and production has been slower compared to past recessions and GDP growth, in the four and a half years after the end of the crisis, has grown at an average of 2.4% (OECD 2014 US Report: pp. 7). The economic rebound has been weaker compared to the other economic crises of the second half of the XX century both in terms of GDP and employment recovery. Four years after the negative peak in GDP growth of 2009, the US economy had regained less than half of what it did in the sixties and seventies. In terms of employment, more than six years afterward, it hasn't reached its pre-crisis levels. Besides the strong financial component of the Great Recession, according to the OECD report, the slow catch-up is due to the smaller public spending, especially in terms of public employment, compared to past crises.

2.2. The economic meltdown in the Eurozone

Financial instability and the economic downfall spread to the other side of the Atlantic, rapidly affecting every corner of Europe. However, countries were impacted upon very differently: some of them were struck earlier and more severely (Greece, Spain and Italy, but also Iceland, Ireland and Portugal) compared to others that generally did better (Germany, France, UK and the Northern countries). Some countries were penalized more strongly by the exposure of financial institutions and banking sector to the subprime crisis in the US (Ireland and UK), while others were damaged later on by the sovereign debt crisis caused by the public coverage of the financial exposure of private institutions (Greece, Spain, Italy, Portugal) and followed by the subsequent consequences for the real economy, namely skyrocketing unemployment and negative and prolonged economic growth due to the stagnation of productivity. The incredibly high density of events during the last six years hinders a complete coverage of all countries and all crisis-related events. Nevertheless, it is still useful to focus on the most important events, especially concentrating on those that more likely have had an impact on individuals' perception of the crisis like the collapse of big financial institutions, the adoption of severe austerity measures, or countries' bailout requests.

Financial troubles related to the subprime crisis in the US appeared in Europe very quickly. An example is the August 2007 termination of withdrawals by BNP Paribas in UK from three hedge funds due to a lack of liquidity in the market and the subsequent intervention of the European Central Bank (ECB) injecting liquidity with more than €200 billion in few days. The escalation then occurred very fast: two weeks later the British Northern Rock was subject to the biggest bank run in more than a century, and was nationalized in February 2008. Central banks were forced to make funding available and cut interest rates throughout the whole year and during the first months of 2008. UK government figures showed that more than 850 companies went into administration during the first 3 months of 2008, with an increase of 54% with respect to the previous year. By the end of the year, the British real estate market also fell on its knees, when house prices dropped by 15.9%.

The Irish government officially announced it was in recession on the 25th September 2008, the month in which unemployment also started to rise sharply. Ireland was the first state in the Eurozone to enter recession as declared by its Central Statistics Office: the GDP fell by more than 3% in 2008 and nearly 8% in 2009. The burst of the construction-industry bubble was responsible for the banking system collapse. This all came to a head in January 2009, when the Irish government nationalized the Anglo Irish Bank[30].

[30] Three days after Ireland announced the start of the recession, in September 28th 2008, the European banking and insurance giant, Fortis, was partly nationalized by the authorities in the Netherlands, Belgium and Luxembourg, to ensure its survival. The authorities coined the motto *too big to fail*. By the end of the month the credit crisis was deepening and the banking sector shaken again when the turn came for Dexia to be bailed out by the Belgian, French and Luxembourg governments.

In Denmark the large exposure of the banking sector and the burst of the housing bubble led to a banking crisis that firstly materialized in July 2008 with the collapse of the Roskilde Bank. Declining property values and increasing mortgage interest rates caused a boom in the number of defaults on loans. In autumn 2008 the Danish government launched the first of five bailouts programs for the banking sector to inject liquidity and stabilize the financial system. The banking crisis in Denmark extended between the summer 2008 and the autumn 2010 and was followed by months of economic recession: 12 months between 2008 and 2009, six months in 2011 and other 6 months of negative GDP growth were registered again at the end of 2012.

The collapse of the Icelandic banking sector[31] of autumn 2008 was, relative to the economy's small size, the largest in its history. The reason for this sudden collapse was the large financialization of the Icelandic economy: much of Iceland's growth prior to the crisis was sustained by the rapid expansion of the financial sector, following the privatization of the banking system in the early 2000s. The massive exposure of the Icelandic banks to foreign assets - more than 10 times the national GDP - caused the collapse of the three largest banks of the country at the end of 2008.[32] By the end of January 2009 the Icelandic government also collapsed, and during the year the GDP fell by nearly 7% and the unemployment rate reached more than 9%.

In October 2008, after days of rally of both American and European stock markets, and the US in the dip of the recession, governments on both sides of the Atlantic announced the intention to coordinate injecting money into the financial system[33]. At the end of the year the European Central Bank announced that the Eurozone had entered into recession in the third quarter of 2008.

The first months of 2009 were characterized by negative economic growth and fast-growing unemployment all over Europe, and by the countless public cash injections into the financial system and stimulus plans to sustain the economy, from Germany to the UK, and southern European countries. In October 2009 unemployment rates in the Eurozone[34] hit a 10-year high (9.7% in September), the worst case being Spain, which approached 18% unemployment in the third quarter of 2009[35].

In June 2009 the European Central Bank (ECB) for the first time warned governments that had borrowed heavily to stop accumulating debt. In fact, later in 2009 fears of the sovereign debt crisis spread among investors as a result of the growing indebtedness of the private and public sectors and the consequent downgrading of government debt in some European countries. Standard & Poor's' cut

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[31] On the 9th of December 2008 the Icelandic bank Landsbanki entered bankruptcy.

[32] Iceland started to grow at 1.2% in the third quarter of 2010 and exited recession in December 2010.

[33] At the end of November the Spanish government announced a €11 billion stimulus package to generate 300.000 new jobs. Exactly one week later France launched a stimulus plan of €26 billion for public sector investments and loans to the car industry.

[34] In 2009 only 16 EU countries had adopted the Euro (Estonia, Latvia and Lithuania entered the Eurozone in 2011, 2014 and 2015 respectively).

[35] Spanish economic growth had slowed down already in 2007, but only in the second quarter of 2008 did the country enter into recession. In 2009 the GDP contracted by 3.7% after 16 years of growth.

of the rating of the Greek debt was the first credit downgrade among western European countries since the start of the financial crisis.[36]

The massive public spending resulting from the bailout of the banking system and the attempts to recover from the negative economic growth busted public deficits and endangered the ability to repay their fast-growing government debts. A crisis of confidence emerged in European countries traditionally characterized by large public debt, and it materialized in widening bond yield spreads between them and the more virtuous ones, Germany in the lead. Moreover, given that many European banks held a significant amount of sovereign debt, the negative spiral of insolvency between private and public debt became inevitably self-reinforcing. The confidence crisis was so remarkable that despite the fact that only a few European countries registered worrisome levels of sovereign debt (Greece, Ireland and Portugal, together accounting only for the 6% of the Eurozone's GDP), the speculation of contagion and the fear of a possible breakup of the Eurozone was so strong that the crisis forced five countries to ask for financial help by the end of 2012 (with Greece, Ireland and Portugal, also Spain and Cyprus). Rumours about other countries being in need of financial help were also becoming more and more frequent at the time in the media (Italy was one of the countries plagued by speculation) and public debates touched repeatedly upon the survival of the Eurozone, put at risk by the scenario of the Greece exit.

Spring 2010 saw a further intensification of the Eurozone sovereign debt crisis, which led to the creation of institutions for financial support between countries: the *European Financial Stability Facility* (EFSF) and the *European Financial Stabilization Mechanism* (EFSM).

The first and most abiding victim of this confidence crisis was indeed Greece. The Greek economy has contracted constantly and substantially every year since 2009[37], while the budget deficit reached 15% of GDP in 2009, 11% in 2010 and 9% in 2011[38]. On the 10th of December 2009 Greece's Deputy Finance Minister, Philippos Sachinidis, admitted that the country's debt had reached the highest level in its modern history[39].

In spring 2010 Greece was again in trouble, and announced a series of austerity measures to secure a loan from the EU and the IMF amounting to 110 billion euros. Massive protests against austerity measures shook the country, ending up with three people dead during a violent protest in which the Marfin bank in Athens was set on fire on the 5th of May 2010 (BBC news)[40].

After S&P's cut Greece's credit rating once more in June 2011[41], Greece became the country with the lowest credit rating in the world[42]. Those summer weeks, from June to September 2011, saw again

[36] At the end of March 2009 S&P cut the Irish sovereign credit rating (Moody's would do the same in December 2010), and by the end of the year Spain too saw its credit outlook cut from stable to negative.

[37] According to Eurostat and World Bank estimates: -4.4% in 2009, -5.4% in 2010, almost -9% in 2011, -6.6% in 2012 and -3.3% in 2013.

[38] Down to 5% of 2014.

[39] The problems escalated in April 2010 when Greece asked the EU and IMF for a €45 billion financial rescue plan and the EU's statistics office reported that the budget deficit was far larger than expected the previous year and that figures might even get worse. A few days later the rating agency S&P's downgraded Greece's debt to the 'junk' status.

[40] BBC news at news.bbc.co.uk/2/hi/8661385.stm.

[41] Outside Greece in 2011 also the Italian, Spanish, Belgian and Hungarian sovereign debts were downgraded.

thousands of protesters in the Greek streets and various national strikes, against the austerity measures undertaken by the ruling class under the requests for more belt-tightening from the IMF[43]. At the end of the year, Papandreu resigned as prime minister and former vice-president Lucas Papadermos took his place.

Austerity measures were on the agenda of other countries too: at the end of November the Irish government outlined a €15 billion in spending cuts and tax increases[44], with the purpose of reducing the budget deficit to 9.1% of the GDP in 2011. In February 2011, the widespread economic uncertainty in the country led to the collapse of the government and the ruling parties, the resignation of the prime minister, and to general elections.

In response to the instability, the Euro started to fall against the dollar, and borrowing for Spain, Italy and Belgium became more expensive as anxiety over the Eurozone debt crisis mounted[45].

At the beginning of April 2011, Portugal – the third country in the Eurozone – requested a financial bailout from the European Union, which was officially approved in May for €78 billion. In the same month, following the failure of the Parliament to pass austerity measures, the government was forced to resign and general elections took place in Portugal in June.

In July Spanish Prime Minister Luis Rodriguez Zapatero also announced new elections for the following November, in which Mariano Rajoy became new PM.

The political turmoil continued in Europe in autumn 2011 with the premature end of national governments in Slovenia and Slovakia, Greece and Italy[46][47].

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[42] *Greece now has the lowest credit rating in the world. S&P says.* Huffington post on line, posted June 13 2011. http://www.huffingtonpost.com/2011/06/13/standard-poors-greece-now_n_876151.html

[43] In October a second loan, conditional to the implementation of further austerity measures, of about €130 billion was offered to Greece, and despite the initial intention of Prime Minister Papandreu to submit the decision over the acceptance of the bailout to citizens through a referendum, the loan was finally accepted by the government, after strong pressure from the Troika (EC, ECB, IMF).

[44] The formal announcement of Ireland's bailout was made on Sunday the 28th of November 2010 at €85 billion.

[45] S&P's announced a possible downgrade for Portugal and Greece in March 2011, and actually cut Portugal's rating twice in the following two weeks, as did the other rating agency, Fitch.

[46] In November, two days after Papandreu's resignation, Berlusconi resigned as prime minister in Italy, and the economist Mario Monti was declared the new prime minister of a technical government. Two weeks later Monti launched a €30 billion austerity package.

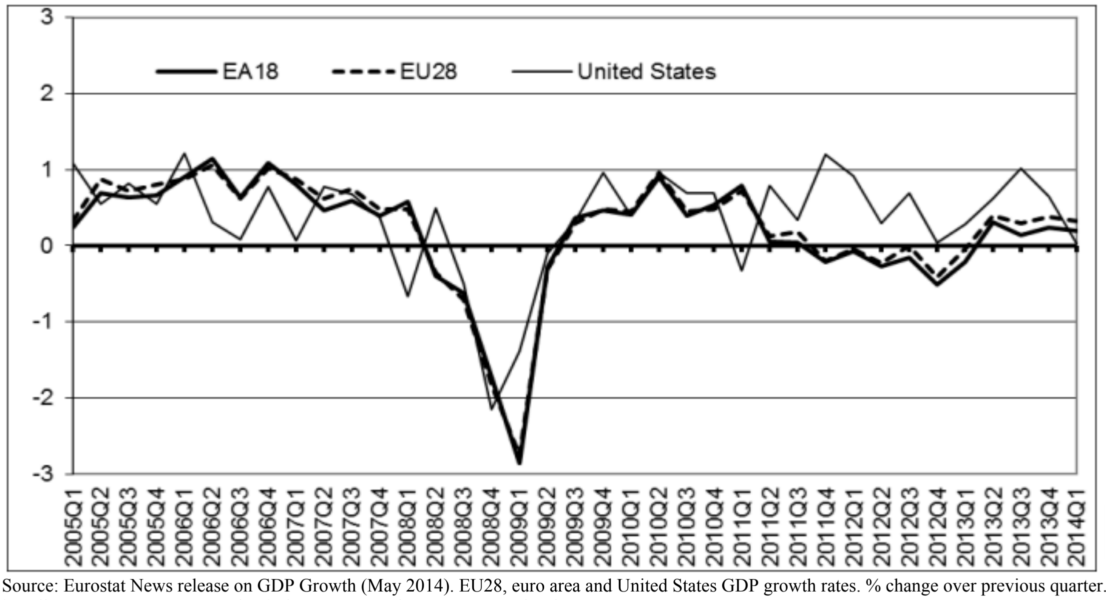
[47] The major economic risk for the Eurozone remains, on the verge of 2015, Greece. Household income is down by a third of what it was before austerity measures and the rate of unemployment is above 25% (and youth unemployment above 50%), Gross Domestic Product is 17% lower in 2014 than in 2008, the national government debt-to-GDP ratio is around 200%, and pension (20%), minimum wage (20%) and social security (5%) have been cut. In total Greece received €240 billion lending, plus €50 billion by the ECB, and new bailouts may be needed in 2015/16.

2.3. Objective economic conditions and perceived economic uncertainty

Among the most commonly used indicators of business cycles there are production and employment. The very definition of recession implies registering two consecutive quarters of negative real Gross Domestic Product (GDP) growth (NBER, Business Cycle dating Committee).

Figure 2.2, published by Eurostat in 2014, shows the latest estimates of GDP growth in the Eurozone and US between 2005 and 2014. The US first entered into recession at the end of 2007 but the largest drop in GDP growth was registered when Europe entered into recession in the second quarter of 2008. The negative peak was -2% in the US and almost -3% in the Euro area. The latter entered into a second recession in the third quarter of 2011 when, as described in Section 2.2, the sovereign debt crisis was already underway. The absolute drop in GDP was less dramatic but the EU stayed longer in recession this second time (for almost eight quarters). In the last quarter of 2012 the Eurozone economy shrank by 0.6%[48]. Countries below the average were Italy, whose economy contracted by 0.9%, Spain (-0.7%), Greece (0.6%) and Portugal, who with a negative GDP growth of -1.8% was by far the worst performer. Germany's economy contracted at the average, while France was the country that did least badly in the Eurozone, with a negative GDP growth at -0.3%.

Figure 2.2: GDP growth rates in the US and EU (2005-2014Q1).

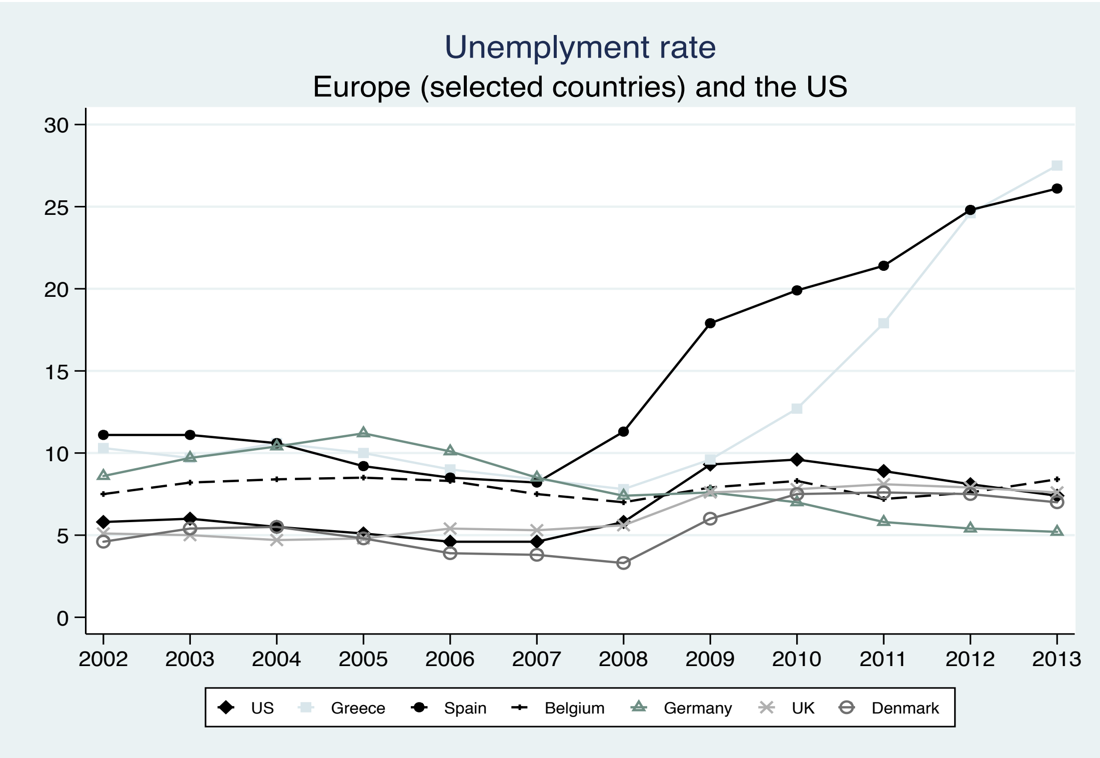


Source: Eurostat News release on GDP Growth (May 2014). EU28, euro area and United States GDP growth rates. % change over previous quarter. http://epp.eurostat.ec.europa.eu/cache/ITY_PUBLIC/2-15052014-AP/EN/2-15052014-AP-EN.PDF

48 In the first quarter of 2014 the Eurozone grew – less than expected – only 0.2%, down from the 1% growth of 2013. Except for Germany, which grew 0.8, the Eurozone is thus basically back to zero growth. Italy had negative growth (-0.1%) – and so did the Netherlands (-1.4%), Portugal, Cyprus (both -0.7%) and Estonia (-1.2%). In most of the countries the growth dynamic remains negative or flat. Together with Germany, it is positive only in Spain, Belgium (both +0.4) and Slovakia (+0.6). Finally, the Greek economy posted its smallest contraction in four years during the first quarter of 2014, shrinking *only* by 1.1% compared to 6% in the same period last year.

The second most-used indicator of economic downturn is unemployment. Figure 2.3 illustrates the trend in unemployment rates in some European countries and in the US. The graph shows that there is substantial country variation in the increase in the deterioration of the job market during the Great recession. In southern European countries like Greece and Spain unemployment rates since 2007 have increased by more than 15 percentage points, reaching the astonishing level of 25% in 2012[49]; in other countries like the US, the UK or Denmark unemployment never went beyond the 10% threshold and increased by around 5 percentage points since 2008. Finally, other countries like Germany or Belgium never really experienced a surge in unemployment rates.

Figure 2.3: Unemployment rate trend in selected European countries and the US (2002-2013).



Source: elaboration of the author based on Eurostat data.

[49] Research by Caritas, a Catholic pastoral agency in Italy, described a *lost generation* and says that around three out of every 10 children in Greece, Ireland, Portugal, Italy and Spain are in, or on the edge of poverty (Euro Intelligence from Reuters). Between January 2008 and April 2013 youth unemployment grew 40% in Greece, 35% in Spain, 22% in Portugal and Cyprus and 20% in Italy. These countries have in common a huge class of non-educated young adults with few job prospects and low morale. Many of those with some education are leaving to seek work elsewhere (in Germany the number of Spanish and Greek jobseekers almost doubled during the first half of 2012). The fact that the media started to use the term humanitarian crisis to describe the situation in Greece, gives an idea of how fragile and dangerous is the situation.

Besides these macroeconomic indicators, the Great Recession has generated a diffused sense of economic uncertainty in markets, institutions, and among private individuals. This uncertainty also tends to reinforce, in a negative spiral, the deterioration of the real economy (International Labor Organization (ILO) Report 2013: 20[50]). Given its complex nature, it is difficult to precisely measure economic uncertainty and the way it has been estimated in the literature is very heterogeneous. In fact, there are many different proxies of economic uncertainty, none exhaustive, but each nonetheless useful in underscoring a certain type of uncertainty. Among the commonly used measures we find financial indicators such as volatility in the stock market or in the sovereign debt risk; or more institution-related indicators like the degree of policy uncertainty revealed in the media; or, finally, consumer-oriented measures such as the consumer confidence index.

Figure 2.4 shows[51] the trend in 10 years of government bond yield in selected European countries in the time interval between January 2007 and December 2013[52]. The trend of long-term interest rates on public debt confirms that the peak of the sovereign debt crisis can be traced to between the end of 2011 and the beginning of 2012.

The interest rate to be paid on the public debt is a very sensitive measure of the risk associated with a country's ability to repay its debt, and therefore of the uncertainty associated with credit worthiness. Germany is usually taken as a reference to measure the relative riskiness of other European countries, being considered the safest country in which to invest, with an interest rate of around 1.6%. The polar opposite is represented by Greece, with a long-term public debt interest rate above 9% since the summer 2010 (orange line). The government bond yield peaked in February 2012 around 29% and again in June around 28%: insanely large rates given that the threshold considered to be critical for debt repayment is 6%. Since then the yield has been dropping and after being around 10% in June 2013, it was at 6.2%[53] in April 2014 but again above 8% at the end 2014 (not shown). Other countries that exceeded the critical threshold of 6% are Portugal, Cyprus, Italy, and Spain[54][55] (and Ireland, see Figure A1.1 in Appendix 1).

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[50] Global Employment Trends 2013. *Recovering from a second jobs dip*.

[51] Published by ECB on www.ecb.int/stats/money/long/html/index.en.html.

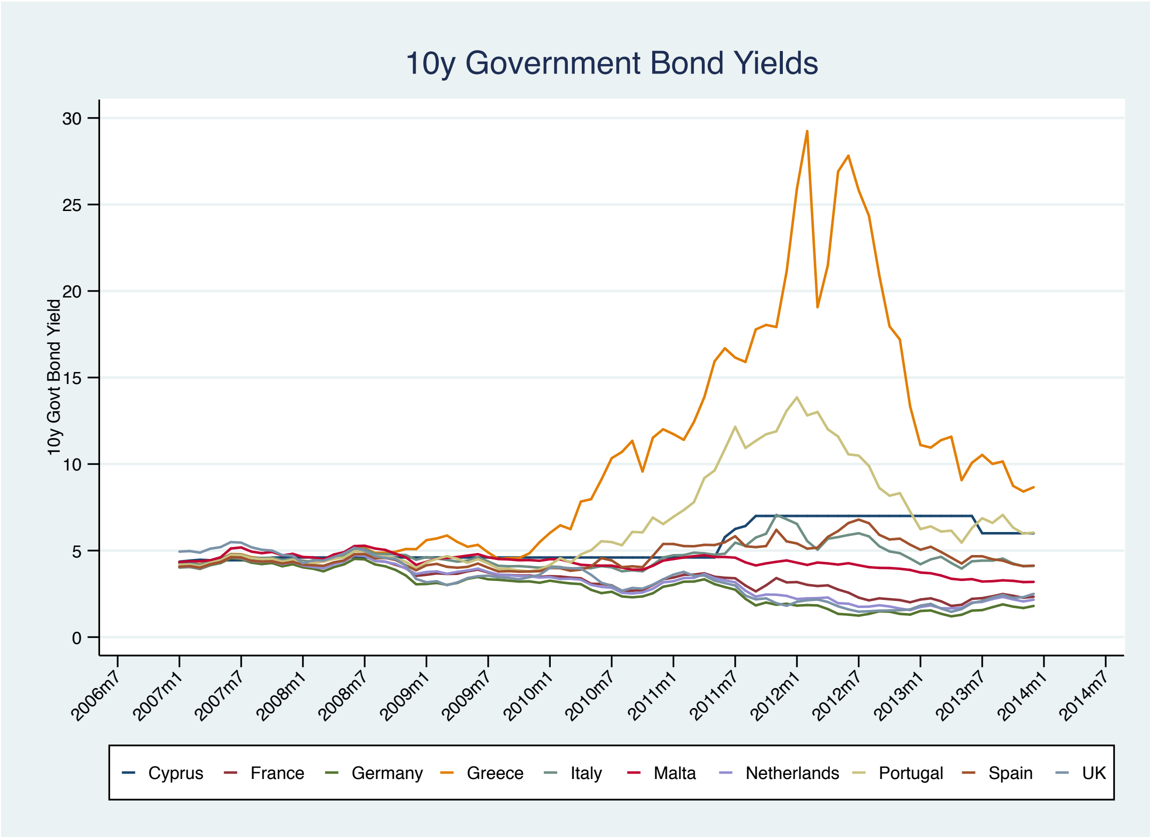
[52] For the complete plot including all Eurozone countries see Figure A1.1 in Appendix 1.

[53] Source: Eurointelligence.

[54] Portugal's (yellow line) and Ireland's (not shown) rates peaked in the summer 2011 surpassing the rate of 12%. One year later Ireland had returned below the critical rate of 6% (it leveled off around 1.6% in November 2014). Portugal instead hit a new spike in January 2012 with a rate around 14% but since then the perceived risk has been steadily declining and today the 10-year bond yields is less than 4%.

[55] Cyprus has been heavily penalized on international debt markets since May 2011 due to its considerable exposure to the Greek sovereign debt. The country asked for financial aid from its EU partners in June 2012 - being the fifth Euro country to ask for bailout after Ireland, Portugal, Greece and Spain - and received from the Troika €10 billion in 2013. In return for the bailout the government was required to severely cut uninsured deposits (mostly held by Russians) and to agree on financial sector supervision.

Figure 2.4: Long-term government bond yield in selected European countries (2007-2013).



Source: Elaboration of the author based on ECB data.

Alongside strictly financial indicators, in 2012 the American professor Scott R. Beker and two colleagues[56] developed another very interesting and quite comprehensive measure of uncertainty: the Economic Policy Uncertainty (EPU) Monthly Index, produced for the US, Germany, France, Italy, Spain, UK and the Netherlands (the latter only recently added). The index is a composite indicator of three measures of uncertainty: the frequency of newspaper references to economic policy uncertainty, the number of federal tax code provisions set to expire, and the extent of forecaster disagreement over future inflation and government purchases. The first component of the index is itself an index of the frequency of reference to policy-related economic uncertainty in the leading newspapers of each country (searching for the terms or derivatives of ‘uncertain’, together with ‘economy’ and one or more terms among: Congress, Fed, deficit or regulation for the US, and tax, policy, spending, central bank, or budget for European countries).

The second component measures the number of temporary tax provisions that will expire in the following years and will be subject to last-minute decision-making by the Congress, of extension or not, clearly creating a source of uncertainty for the actors in the economy. This component of the index is present only in the case of US, expiring tax-code provisions being a very typical feature of the

[56] Scott R. Beker is Assistant Professor of Finance at the Kellogg Management School at Northwestern University; N. Bloom is Professor of Economics at Stanford and S.J. Davis is the William H. Abbott Professor of International Business and Economics at the University of Chicago Booth School of business

American economy and not being relevant for European countries.

The third and last component is the economic forecaster disagreement drawing, for the US, from the Federal Reserve Bank of Philadelphia's Survey of Professional Forecasters (SPF), and the Consensus Economics Forecast database of public expenditure, for each of the other six European countries.

For the US the authors used individual data of forecasts on three variables: the Consumer Price Index (CPI), the purchase of goods and services by the state and local governments, and the purchase of goods and services by the federal government. The dispersion of the forecasts on those variables represents the uncertainty related to monetary policy issues and consumer confidence insecurity.

For the European countries the index relies instead on the dispersion of individual forecasts on CPI and budget balances, scaled by national GDP[57].

VAR estimates[58] show that the resulting index is very accurate in predicting economic shocks. The estimates also show that the increase in the EPU Index from 2006 to 2011 – which more than doubled in this period – predicted declines of up to 2.3 percentage points in GDP and 2.3 million in employment positions.

Figure 2.5 illustrates Becker's et al. (2012) EPU Index[59] monthly trend between January 2000 and March 2014[60] in the US and in European countries. The level of uncertainty is clearly higher during the Great Recession compared to other previous events, for example the 9/11 terrorist attacks in the US. The black line represents the EPU monthly index in the US. The trend is very similar to that of the Eurozone countries (in grey), which start to rise in late summer 2007 and rise more sharply with the Lehman Brothers bankruptcy in September 2008, when the index reached 190 points. It stayed at quite high levels during 2009 and it peaked again in August 2011 at 245 points, after the Congress passed a bill allowing a raise in the country's borrowing limits and S&P downgraded the credit rating of US bonds for the first time in history. Since then the index of uncertainty stabilized around 100 points, a level comparable to the pre-crisis period (it is still 25-20 points above the 2007 value).

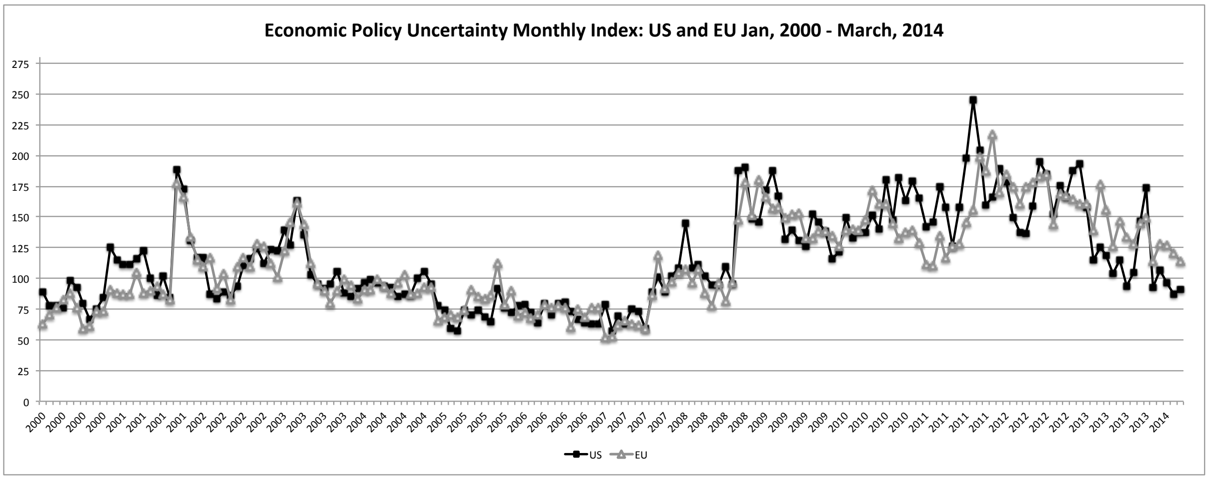
[57] The limitation of this index is that it cannot really distinguish between real economic uncertainty and consumer confidence, as perceived for example through the bad news in the newspapers. This issue however is less relevant in the present study since I focus on the most general type of economic insecurity. It goes beyond the scope of this chapter to distinguish the effects of economic-policy uncertainty on business and households from the perception of this same economic insecurity.

[58] Vector Autoregression (VAR) analysis is a model illustrating the linear interdependencies among multiple time series. Each variable is explained by its own lags and the lags of the other model variables.

[59] Data are freely available on www.policyuncertainty.com.

[60] The general EPU index is not available from April 2014, after which only the Newspaper Uncertainty Index is available.

Figure 2.5: Monthly Economic Policy index, US and EU (2000-2014).



Source: Elaboration of the author based on Becker et al. (2012, 2015). EPU Index data available on www.policyuncertainty.com.

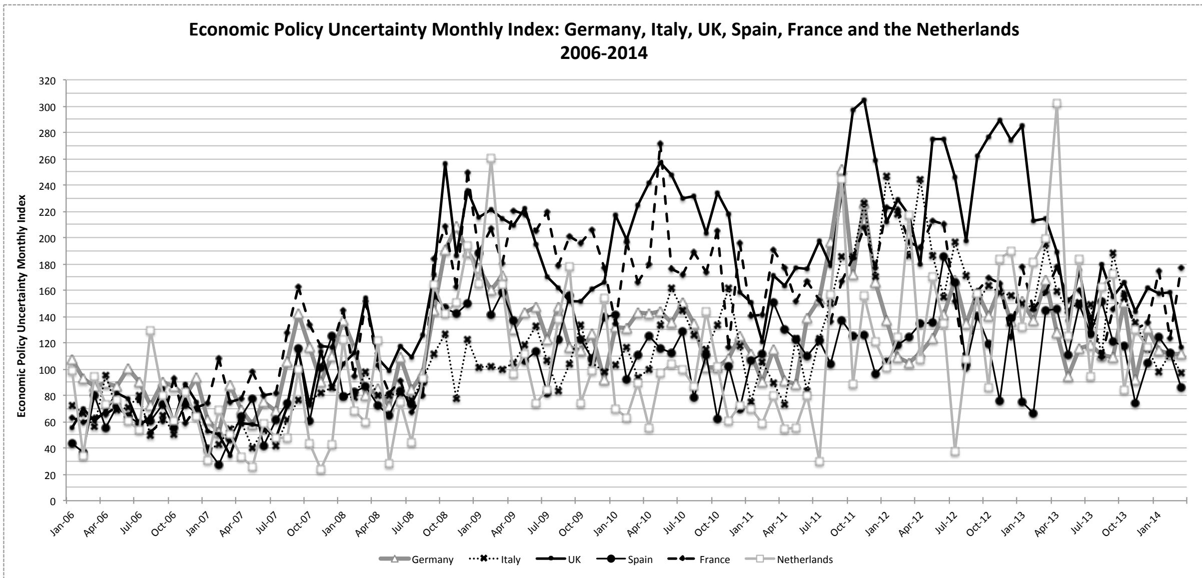
Figure 2.6 plots the EPU index in the six European countries – Germany, Italy, UK, Spain, France and the Netherlands – in the time interval 2006-2014. The index is, as expected, highly correlated with the events described in the previous section of this chapter, peaking simultaneously first with the collapse of financial institutions in Europe and the US, and later on with events related to the sovereign debt crisis, like the Greek requests of financial aid, and the following riots and heavy protests in the country, or the resignation of the Italian government in November 2011.

All the six European countries started in January 2006 with a very similar EPU index ranging between 40 for Spain and 100 for Germany (though the Netherland's index is very volatile in the entire period). The trend had been quite stable up to the late summer 2007 at which time the index started to rise in all the countries, the first relative peak occurring in October 2007 with the first bank runs on American and European financial institutions, as described. The index roughly stabilized during the following 12 months, to begin rising again in August 2008. This is especially true in the UK and Germany, whose financial institutions were more involved in the subprime mortgages crisis exploding at that time in the US, hitting 250 in the former and 210 in the latter. In November 2008 the ECB officially announced that the Eurozone had entered recession. The index of Spain grew to 190, after that date too, due to the stimulus package that had to be passed to protect the Spanish economy.

Thanks to injections of liquidity from the public to the financial sector, the level of uncertainty was initially attenuated, until the spread of the first fears in the markets of the burst of public deficit in some European countries and the subsequent risk of default on the sovereign debt.

The confidence crisis materialized in late 2009 and spring 2010, when the uncertainty index peaked at more than 251 in the UK and 270 in France (May 2010) and at more than 160 in Italy a month later. In Germany and Spain the EPU started to increase dramatically only during summer 2011, rising to its maximum level in autumn up to the point where both the Italian and the Greek governments had lost all their credibility on international markets and, as a consequence, were forced to resign. Since then, during 2012, the trend has fluctuated strongly in all the six countries, with the UK (apart from the spike of uncertainty in the Netherlands at the beginning of 2013) always scoring higher in economic policy uncertainty, being close to 300 still in November 2012. For the other countries the situation seemed to be getting better during the year, even if in Spain in June 2012 the economic uncertainty very likely rose because of the financial aid necessary to sustain its banking sector and the steadily increasing costs of its public debt, with interest rates reaching almost 7% that summer. Only in spring 2013 did economic insecurity seem to start easing in all the six European countries, even though still by mid-April 2014 it had not returned to its pre-crisis level yet.

Figure 2.6: Monthly Economic Policy Uncertainty index in GER, IT, UK, SP, FR, NETH (2006-2014).



Source: Elaboration of the author based on Becker et al. (2012, 2015). EPU Index data available on www.policyuncertainty.com.

3. Explaining the recent decline in fertility: the Great Recession

The picture presented in the last section of a nearly collapsing financial sector, an induced sovereign debt crisis in the Eurozone and effects for the real economy of negative growth and rising unemployment, suggests that the consequences of the Great Recession for households might have been heavy. Credit conditions have been tight both for firms and for individuals because banks were using liquidity to rebalance assets and debts in their balance sheets, which meant, for households, lower spending power and an even lower likelihood of being able to afford buying a house. Firms, when still in the market, preferred to take a prudent attitude and postpone investment and hiring. The public sector in many countries curtailed resources in support of financial institutions at the beginning of the crisis, and recently for social security provisions. Moreover, the widening of public deficits obliged governments to adopt severe austerity measures, by raising taxation and reducing public expenditures, implying that fewer resources were available for social policies directed to families.

These deteriorating economic conditions have grinded on households' consumption, investment and savings arrangements, and they might have weighted on family dynamics. The aim of this chapter is to investigate how big the impact of macroeconomic factors on fertility rates has been, but to start with, it is important to assess whether there is a phenomenon that needs to be explained[61].

Figure 2.7 illustrates the trend in TFR in nine European countries and in the United States (dotted line) during the period 2002-2013. The first relevant pattern in the figure is the well-known persistent north-south dichotomy in fertility: in the last decade northern European countries, and the US, kept an average fertility rate around 1.9-2, while southern European countries like Italy, Greece and Spain averaged 1.3-1.4 children per woman, in the same time interval.

Fertility in Central Europe has been also quite low: the example reported in the figure is Poland which is, together with southern European countries, one of the countries with the lowest fertility levels in the world, the TFR in the period 2004-2011 averaged in fact only 1.32.

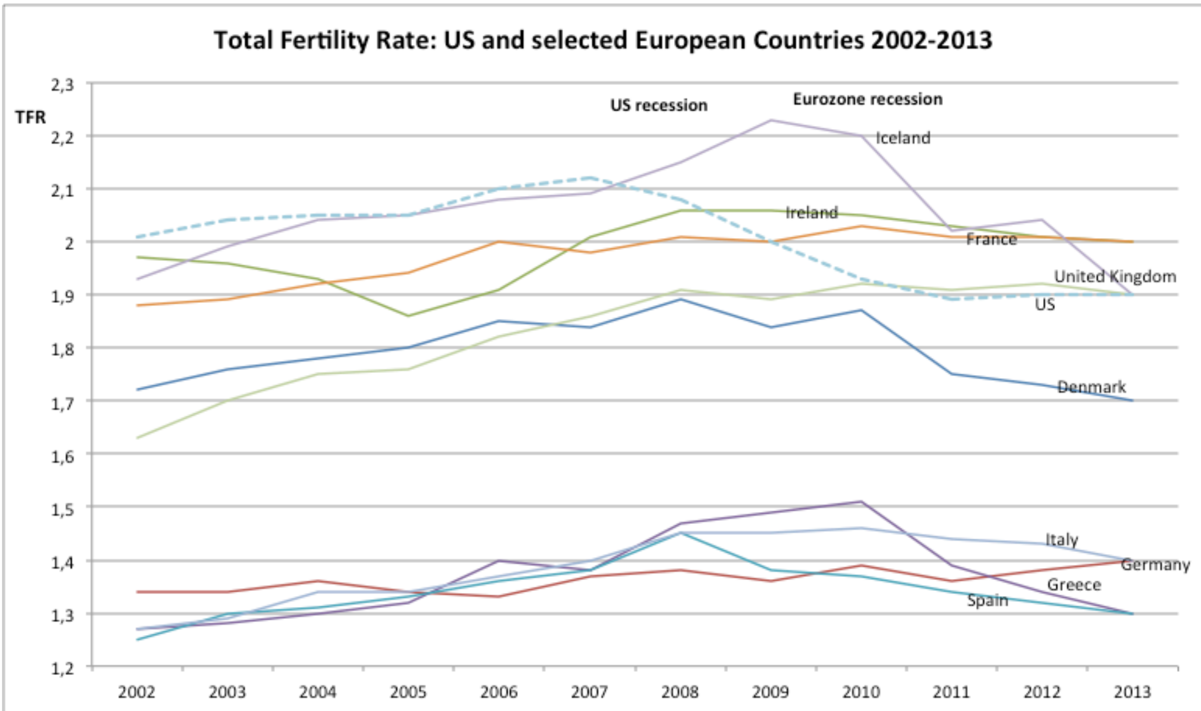
The second interesting and widely known fact is that, in both groups of countries, the beginning of the 2000s saw a diffused and stable increase in fertility (amounting to around 0.1 in the US and around 0.2 in Europe), which peaked in 2007 in the US registering a TFR of 2.12 and generally a year later in most European countries (with the exception of Iceland, which reached its highest fertility rate, 2.23, in 2009). Greece was the country that showed, in the last decade, the sharpest increase in TFR: +0.25 between 2002 and 2009.

This positive trend in fertility, the first continent-wide one since the baby boom of the seventies (Sobotka 2013), has been explained by the recuperation of the births that were postponed during the

[61] In R.K. Merton's word (1987: 2-6) if there is "enough of a regularity to require and allow explanation".

nineties. The rise in TFR at the beginning of the century would have been an 'artifact' of the measure that did not take into consideration that women were slowing down the pace of postponement, anticipating births with respect to the decade before. However, being this due to a *tempo* or a *quantum effect* (i.e. temporary or permanent), it is an established fact that between 2002 and 2008 societal conditions seemed favorable to fertility and TFR increased on average in European countries by about 0.15 live births per woman (Lanzieri 2013).

Figure 2.7: Total Fertility Rate in selected European Countries and the US (2002-2013).



Source: Elaboration of the author based on Eurostat data for European countries, and US data from US National Center for Health Statistics. Data for 2013 from the Population Reference Bureau (Washington DC)[62].

62 http://www.prb.org/DataFinder/Topic/Rankings.aspx?ind=17

3.1. Recent fertility trends in the United States

Figure 2.8 focuses on fertility in the US during the recent period: 2000-2014. As already pointed out, the US is no exception to the generally positive fertility trend of the first years of the 2000s, and in fact between 2002 and 2007 the TFR increased from 2 children per woman to 2.12.

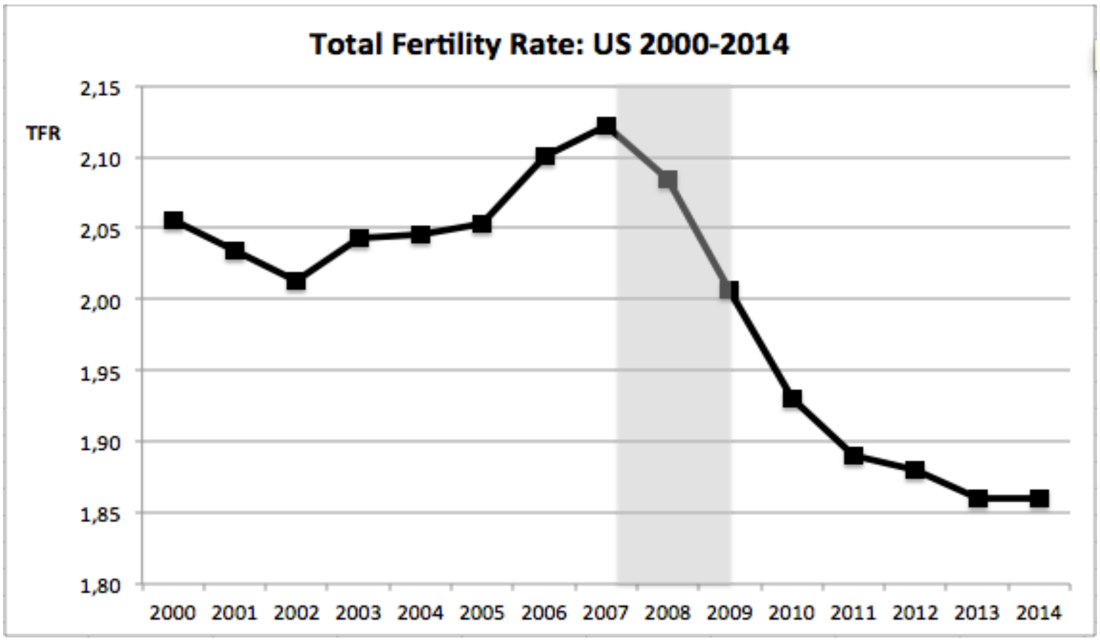
According to the National Vital Statistics (2011), the highest number of births in the US since the 1960s was registered in 2006, but besides the positive trend in fertility, during the first years of the 2000s the US saw various changes in very important childbearing-related features: teenage pregnancies, for instance, dropped significantly (22% lower in 2000 than in 1991) and for 14 years in a row (until 2006). The mean age at first birth kept increasing until reaching 25 in 2006, albeit with large regional variation (in 2006 the lowest age was Mississippi with 22.6 and the highest was Massachusetts with 27.7 years old)[63]. The median age at first marriage kept increasing too and, since the '70s when it was below 21 years old, it reached 24 at the beginning of the nineties when it overtook the median age at first birth, and since then stayed above being almost 27 in 2011 (26 for first birth).

The National Center for Family and Marriage Research (Hymowitz et al. 2013) reports a large difference across educational levels in the median age at first birth and marriage, registered in the country in 2010: college-educated women marry around 27 years old and have their first child around 30; on the contrary, poorly educated women (less than high-school) marry at 25 and become mothers around five years before, and women with a high-school diploma or some college marry at 26 and have a baby around 24. Compared to ten years ago, the median age of first births has increased but not changed that much, in all educational groups, while age at marriage has seen a sharp rise in all groups, especially for poorly educated women for whom in 2000 the age at marriage was around 22 years old (Hymowitz et al. 2013).

Voluntary childlessness was less diffused in the 2000s compared to the nineties, with 6.2% of women declaring themselves voluntarily without children in 2002, compared to the 6.6% of 1995 (Roy et al., 2014).

[63] The geographic variation reflects the racial and age composition of the population: immigrants, especially Hispanics, tend to have more children and have them at younger ages, and southern US states have a much larger proportion of White Hispanics, compared to northern and especially northeastern States.

Figure 2.8: Total Fertility Rate in the US (2000-2014).



Source: Elaboration of the author based on data from US National Center for Health Statistics.

From 2007 onward though, the steady positive trend in fertility in the US came to a halt. A large decline in fertility has been in fact registered for four consecutive years from 2007 to 2011, when the TFR moved from more than 2.1 (the replacement rate) to 1.89, only slightly increasing to 1.90 in 2012 but falling again in 2013 to 1.86 children per woman[64] (a 12.3% decline since 2007, according to the US National Center for Health Statistics), far below the early 2000s rates. Also the General Fertility Rate[65] (not shown), in the same period 2007-2013, declined by 10.1% (69.5 to 62.5).

The age at first birth reached 26 years old in 2012 (CDC estimates).

The proportion of non-marital births, after years of remaining constant at around one-third of total births, increased to 41% in 2009, and almost to the half (48%) in 2011 (Hymowitz et al. 2013) and only one-fifth of those were due to teenagers' childbearing. There are large ethnic differences also in out of wedlock birth rates, with only 29% of White mothers having children outside marriage, compared to the much larger 53% of Hispanics and the 73% of Black mothers (Roy et al., 2014).

Educational differences in non-marital births are also growing larger: in 2010 only 12% of women with a college degree had their first child out of wedlock, versus 58% of women with a high-school diploma or some college and 83% of high-school dropouts (in 2000 the percentages were respectively of 8%, 74% and 44%). For comparison, in 1970 only 3% of highly educated women were not married at first birth, 12% of the middle groups and the 33% of the very poorly educated women (Hymowitz et al. 2013).

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[64] In particular, fertility was 1.8 for White women, 2 for African American, 2.6 for Mexican and 3.5 for other Hispanic women (National Vital Statistic 2011, as reported by Roy et al., 2014).

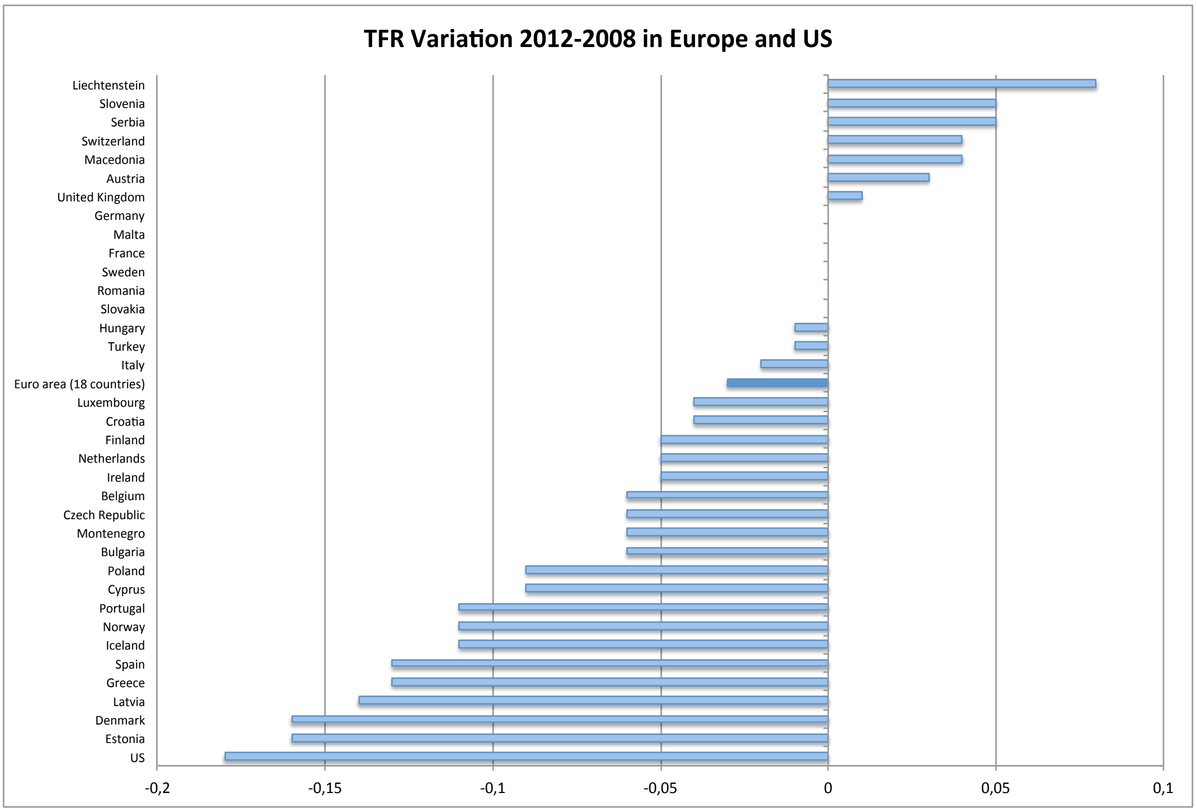
[65] The General Fertility Rate is the number of births per 1000 women of 15-44 years old.

3.2. Fertility trends in Europe

The fertility drop in Europe was delayed, with respect to the US, by one or two years, excepting the UK, which registered a slight decline between 2008 and 2009 but recovered already one year later; Germany where – though with ups and downs – the TFR in the last 5-6 years basically didn't change; and France that showed a constant fertility rate and an increase between 2009 and 2010, nullified between 2010 and 2013. All the other European countries recorded a drop in fertility after 2008: in some countries the drop was more pronounced, like Iceland, Greece and Spain (Denmark also saw a remarkable – of almost 0.2 – decline in fertility but only after 2010) while in others the fertility drop was more modest and smooth, i.e. Ireland and Italy (around 0.05).

Figure 2.9 depicts in particular the change in TFR between 2008 and 2012 for 35 European countries (for which Eurostat publishes annual TFR data) in comparison to the US. Of those, 23 registered a decline in fertility, six saw no change and in only seven of them the TFR increased between 2008 and 2012. Among the latter the average increase was of 0.056 children per woman, while the average drop in fertility in the 23 countries was of about 0.081 children per women. The highest decline in TFR happened in the US (-0.18), where the crisis materialized earlier. As mentioned, the drop was significant in southern European countries, in particular Spain and Greece, but also in some northern countries like Denmark, Estonia and Latvia. Germany, France and Sweden are among the countries where the positive path of fertility of the early 2000s did not reverse but only halted after 2008. Eastern European countries like Macedonia, Serbia and Slovenia actually registered, instead, a slight increase in fertility of around 0.03-0.05 children per women.

Figure 2.9: Total Fertility Rate variation in EU and US (2012-2008).



Source: Eurostat.

4. Literature background

Many authors have investigated the macro-level relationship between business cycles and childbearing, especially in the aftermath of the Great Depression and in the last years after the Great Recession. The vast majority of the studies argues for, and finds evidence in support of, a pro-cyclical relationship of births to economic fluctuations in advanced economies (Rindfuss et al. 1988; Tzanatos and Simons 1989; Lee 2003; Livingstone et al. 2010; Sobotka et al. 2010, 2011; Livingstone 2011; Morgan et al. 2011; Ananat et al 2013; Black et al 2013; Cherlin et al 2013; Goldstein et al. 2013; Hofmann et al. 2013; Currie and Schwandt 2014; Schneider 2015). Some analyses descriptively track the declining trends in general and total fertility rates (some differentiating between age, parity, ethnicity-specific rates) by country or in comparative perspective, across recession periods (Livingstone and Cohn 2010; Morgan et al 2011; Cherlin et al 2013).

Conversely, very few studies (Butz and Ward 1979; Ermisch 1980, 1988) put forward the theory that couples take advantage of the limited opportunities in the labor market during recessions to have children. In a well known, but questioned (Ahlburg 1983; Macunovich 1995, 1996; McDonald 2000) work, Butz and Ward (1979) argued that at high levels of female participation in the labor force, fertility becomes counter-cyclical (birth rates increase when unemployment rates also increase) because of the lower opportunity costs of childbearing for working women. The latter take advantage of a period of unemployment to become mothers so that in the future they will not have to renounce a good job to have a baby.

One way of classifying the evidence on the topic is by the different ways in which business cycles are operationalized in the analyses, through the various financial and macroeconomic indicators that proxy the ups and downs of the economy: some of them capture the structural tendency of the real economy, while others reflect more the actors' (markets, institutions or individuals) perception of the economy, present and future.

A first strand of research investigates the correlation between productivity (usually GDP) or economic growth, and fertility rates.

For instance, recently Morgan et al. (2011) investigated the period effect of US recessions since 1975 and show their pro-cyclical correlation to fertility: when the economy goes down, so does fertility. Sobotka and colleagues (2010, 2011) show that among 27 low-fertility countries in the period 1980-2008, in the 81% of the episodes of GDP decline and in the 65% of the cases of GDP stagnation (yearly growth less than 1%) a fall in TFR followed.

Adsera and Mendez (2011) find a positive correlation between GDP and fertility rates in 18 Latin American countries and Lanzieri (2013) finds that GDP growth is positively correlated to changes in TFR also among European countries (additionally showing that fertility responds to the economic shock with a delay of 19 months).

However, in many of these studies, once variables like unemployment, individual socio-economic variables, or consumer confidence are introduced into the model, this correlation disappears (Sobotka 2010; Adsera and Mendez 2011) suggesting that indicators other than the GDP better capture the impact of the business cycle on fertility.

Some studies then focused on income instead. One of those is the Pew Research report by Livingstone (2011) that relates the fertility decline in the US to the decline in income per capita.

In another interesting paper Black et al, (2013) exploit the coal boom of the 1970s as a natural experiment to assess the effect on fertility of a sudden increase in men's income (in the coal-mining region of the Appalachian). The authors find a 3% increase in completed fertility for the cohorts that benefited from a total income increase of 6%.

A larger branch of research focuses on unemployment rate, using it in aggregate time-series studies to investigate the relationship between the business cycle and fertility. In the US both men and women's unemployment rates and (especially) young women's rates have been found to reduce childbearing, usually more pronouncedly for second or higher-order births (Macunovich and Easterlin 1988; Macunovich 1996). However, Rindfuss et al. (1988) find a negative effect of unemployment on first births (without making any distinction between men's and women's unemployment) in the US. The authors report large similarities in the effect of unemployment on fertility across decades after the Great Depression in the US, suggesting that the negative response of births to unemployment is not just a crisis-related pattern. Similar results on the inhibiting effect of men's unemployment on first births have been shown for Europe, in particular for the UK in the post-war period (Ermisch 1988) and during the Great Depression (Tzannatos and Symons 1989).

More recent research on the Great Recession in the US has been conducted. For instance, Morgan et al (2011) showed negative correlation between unemployment rates and the change in fertility rates in 2007-09 and Cherlin (2013) repeated the analysis on the impact of the percentage point change in unemployment and the percentage point change in GFR between 2007 and 2011 in the US. Ananat's et al. (2013) analyzes the general fertility rates response to mass layoffs in North Carolina counties during the nineties and up to 2010. They find a negative fertility effect only for African American teens and no effect for White American teens or women in their twenties.

Currie and Schwandt (2014) investigate both short- and long-term effects on births of increasing unemployment using pseudo-cohorts of American women. They show a negative overall effect of -0.5 conceptions per 1000 women for each percentage-point increase in unemployment. Looking at specific age ranges, the authors find, in line with the literature, that the fertility of younger women is more negatively affected by unemployment compared to older women (they found no effect on women around 40 years of age). A 1% increase in unemployment rate experienced around 20-24 years of age reduces conceptions in the same age group (short-run effect) of about 6 births per 1000 women, and reduces completed fertility of these women at 40 years old of about 14 conceptions per 1000 women.

Schneider (2015) finds very similar effects analyzing national and local employment conditions across the Great Recession in the US: at the state level, the general fertility rate declines of 0.60 births per percentage-point increase in unemployment rate, after controlling for demographic characteristics of the state and adding state and year fixed effect. The author predicts that this effect, considering the increase in unemployment during the recession, means a sizeable reduction of 7.5% in births. He also notes that the effect is larger for younger women and declines with age.

Other studies have investigated the nexus between unemployment and fertility in Europe (Özcan 2010; Adsera 2011; Goldstein et al 2013; Lanzieri 2013; Neels 2013; Sobotka 2011; 2013). The unemployment rate in general was found to have depressed fertility during the Great Recession; this is especially true of long-term men's unemployment rates on first birth rates to childless couples (Adsera 2011; Neels 2013) and among young adults below 25 years of age (Goldstein et al. 2013; Lanzieri 2013; Sobotka 2011; 2013). In the already-mentioned study, Lanzieri (2013) finds a lag between the unemployment rate rise and fertility drop of 19 months on average in European countries (similar to that of the fertility reaction to GDP growth). Neels et al. (2013) show a strong negative effect of unemployment on the hazard of first births among men and women below 30 years of age, especially for the highly educated. After 30 it influences the probability of men having children, with no corresponding effect on women.

The paper by Goldstein et al. (2013) on Europe is especially interesting for the present investigation. The authors conducted a study on the effect of unemployment rates on age and parity-specific fertility rates in 28 European countries (they include Russia) in the period 2000-2010, using data from the Human Fertility Database, Eurostat and the OECD database. The authors find that the elasticity of fertility to unemployment is negative and especially concentrated on very young women and on first births. The effect of a percentage-point increase in unemployment rates generates a 0.2% decline in first birth rates among 15-19 years old women and a -0.1% among women 20-24. The effect on second and third births is smaller and generally not statistically different from zero.

A third group of studies investigates how the perception of an economic downturn and of future uncertainty might affect fertility rates.

Already in the sixties the economist G.S. Becker (1960) studied the US between 1920 and 1957 and argued that changes in fertility rates were positively correlated with the purchase of durable goods. His more recent studies have considered the relationship between consumer confidence and fertility. In the

US, Schneider (2015), besides looking at unemployment, analyzes the effects of mortgage foreclosure start rate, press coverage of the Great Recession and consumer confidence on birth rates. The author finds for foreclosure start rates a very similar negative effect to that of unemployment (-0.64 point reduction in GFR), and that higher levels of confidence are associated with significantly higher fertility rates. Press coverage of the crisis is negatively but moderately linked to the general fertility rate (GFR).

For Europe, in the Netherlands, both van Giersbergen and de Beer (1997) and Fokkema et al. (2008) report a positive association between the two variables: in the former study an increase in the index of consumer confidence of 10% is associated with a +1.5% in total births per year; and the latter show that an increase of 10 points in the confidence index is associated with an increase of 0.04 in TFR, a sizeable effect. Hoffman and Hohmeyer (2013) find a negative effect of perceived future employment instability on fertility of German couples, driven mainly by women's concerns about the future in male-breadwinner households.

As illustrated, the macro evidence on the correlation between business cycles and fertility is extensive. Nonetheless a comprehensive study of the fertility response to a combination of the different aspects (objective economic conditions and economic insecurity perception) of the recession is still missing. This is precisely the objective of this first empirical chapter of the thesis.

The analysis that follows is divided in two main parts: in the first part, starting from Goldstein et al.'s (2013) work, I investigate the elasticity of age and parity-specific fertility rates in the European countries and the US to the yearly variation of the different financial and macroeconomic indicators of the Great Recession, illustrated in Section 2.3. Importantly, not only do I expand the dataset and the number of explanatory variables, but I also try to combine the latter in a unique picture to grasp how these different components of the crisis affect childbearing rates.

In the second part I exploit the availability of monthly birth data and monthly fluctuations in those economic indicators to get a more precise sense of the correlation between fertility and variation in economic conditions.

In both the first and second part of the analysis I also investigate the geographical heterogeneity in the economy-fertility correlation, with a special focus on US and southern European countries that were hardly hit during the sovereign debt crisis after 2010, as shown in Section 2.2.

5. The impact of aggregate economic indicators on age and parity-specific fertility rates in Europe and the United States

5.1. Method: variables, data and the sample

This first empirical investigation of the fertility response to macroeconomic indicators of the Great Recession starts from the analysis conducted by Goldstein and colleagues (2013) on the elasticity of age- and parity-specific fertility rates to unemployment in Europe in the period 2000-2010.

The dependent variables on which I focus in this section are the annual Total Fertility Rate, age-specific fertility rate (ASFR) and parity-specific TFR (for first and second births). All fertility data are retrieved from Eurostat and US National Vital Statistics for the US.

In comparison to Goldstein's et al.'s (2013) paper, the analysis unfolded here includes more countries, more recent data and it tests different explanatory variables beyond unemployment rates that might convey the effect of the Great Recession on childbearing across countries. In particular I analyze four key explanatory variables in 31 European countries plus the US in the time period 2003-2013[66].

The worsening of the economic objective conditions during the recession is captured by annual general and youth unemployment rates.

However, beyond material hardship, also economic uncertainty and future expectations play a role in shaping childbearing decisions (Sobotka 2010; Kreyenfeld 2012; Hoffman and Hohmeyer 2013; Schneider 2015). Hence, I included in the analysis different measures and indexes of uncertainty about the economy.

One macro-indicator of the intensity of an economic crisis and its associated economic uncertainty is market volatility. In the case of Europe, as already shown, the main confidence crisis concerned sovereign debt, and a good proxy of market expectations is the trend in government bond yields. The cost of repaying public debt, namely the interest rate to pay on it, is a powerful measure of the market credibility of a government, which was severely undermined in some European countries during the last three years of the sovereign debt crisis. This more general feeling of financial and economic insecurity about the future is thus represented by sovereign debt risk, measured through long-term (10-year) government bond yields. The second measure of economic uncertainty I am using, more

[66] From the thirty-two countries for which Eurostat data on birth rates were available I dropped only Turkey (because of many missing data and because substantially it is a very different country for the others).

comprehensive in its design, is the annual average of Beker's (2012) monthly Economic Policy Uncertainty (EPU) Index, described in Section 2.3.

Unemployment and youth unemployment rate data (from Eurostat) are available for all the 32 countries considered, while government bond yields (from Eurostat and for the missing countries from the ECB, Bank of England, OECD and Federal Reserve Economic Data, St. Louis FED) could be retrieved for all countries except Croatia and Estonia. As described earlier, the EPU index was created only for US, Italy, Germany, France, the UK, Spain and (only recently) the Netherlands.

The aim of the analysis is to show the separate and joint effect of these financial and macroeconomic variables on fertility rates. In the following analyses all variables are log-transformed, so that I estimate the effect of the recession on fertility in terms of the elasticity of fertility rates to the macroeconomic indicators (also to make them comparable to the results of Goldstein et al.'s paper).

The density distribution of each independent variable and its log-transformed distribution are illustrated in Figure A1.2 in Appendix 1.

All independent variables are lagged to the previous year and country dummies are included to capture country-specificities in fertility. A linear time trend is also added to capture the underlying period fertility trends, associated with the postponement of fertility, typical of all low-fertility countries. Finally, the linear time trend is interacted with the country dummies so as to capture any country-specific time trend in fertility, as done also in Goldstein et al. (2013).

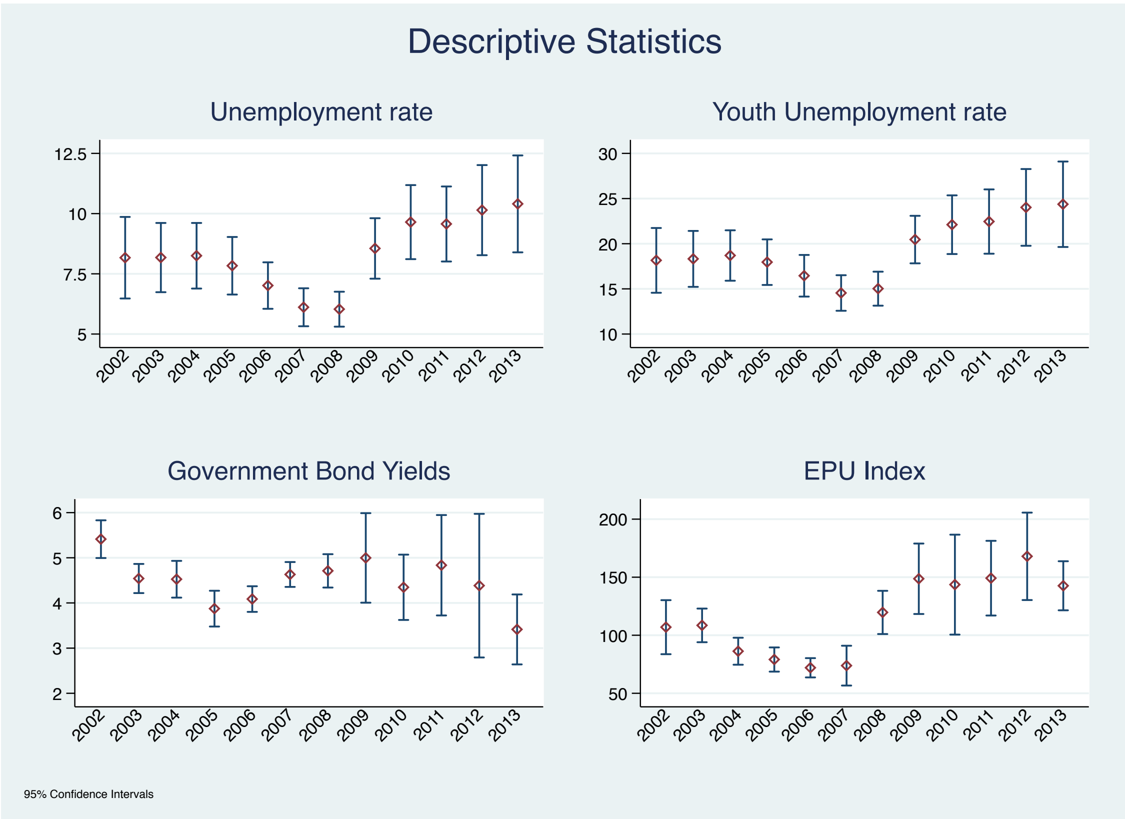
In this analysis, compared to Goldstein et al. (2013), I look more specifically into cross-country differences in the effect of the indicators on fertility, first separating European countries from the US and, second, within Europe constructing country the following clusters: Western Europe (Austria, Belgium, France, Germany, Ireland, Luxembourg, Netherlands, Switzerland, UK); Central-Eastern Europe (Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia); Northern Europe (Denmark, Finland, Iceland, Norway, Sweden) and Southern Europe (Cyprus, Greece, Italy, Malta, Portugal, Spain).

The results are shown graphically to the greatest extent possible, to facilitate an immediate grasp of the results. Complete regression tables are available in the appendix at the end of this chapter.

5.2. Results

Figure 2.10 shows the means and confidence intervals of the macroeconomic indicators used in the analysis by year, pooling all 32 countries together. After 2009 we witness a large increase in unemployment rates, both general and of young adults (top panels). Between 2008 and 2009 general unemployment went from around 6% to more than 8%, reaching 10.4% in 2013, and the variation in the sample also increased a great deal. Youth unemployment increased on average from 15% to 20% between 2008 and 2009, peaking at almost 25% in 2013. The figures show a huge +70% in both unemployment and youth unemployment rates between 2007 and 2013 in those 32 countries.

Figure 2.10: Great Recession financial and macroeconomic indicators. Means and 95% confidence intervals.

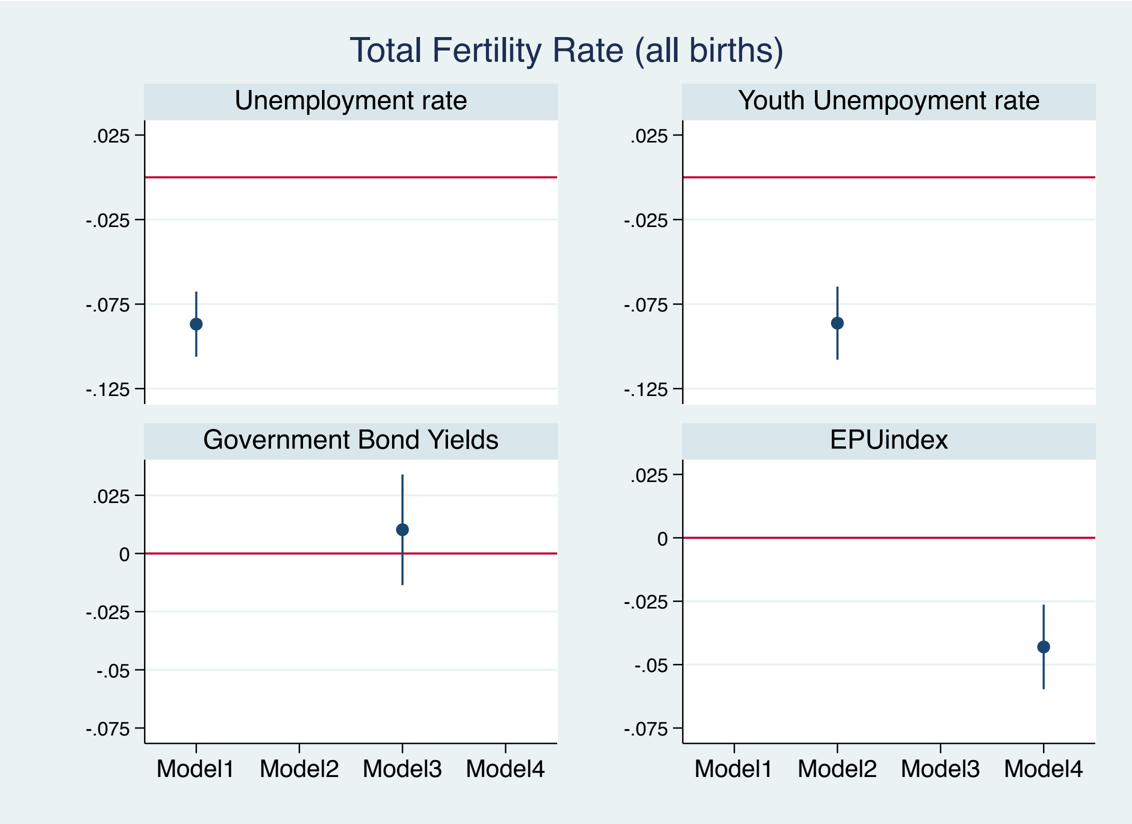


Source: elaboration of the author based on data from Eurostat, ECB, Bank of England, OECD and Federal Reserve Economic Data (St. Louis FED), US National Vital Statistics and US Treasury. EPU index by Beker et al. (2012).

Interest rates on public debt (bottom left panel in Fig. 2.10) also rose on average after 2009 compared to 2005-2006 but the increase is extremely small compared to the other explanatory variables (+4% only between 2007 and 2011), since the sovereign debt crisis was very much concentrated in particular southern European countries. Long-term bond yields also tend to decline soon after 2011. The variation in that sample though increased significantly after 2009. I don't expect therefore sovereign debt to be determinant in the complete analysis including the entire sample, but I do expect to find some effect in southern European countries where the large increase in the cost of public debt materialized.

The EPU index (bottom right panel in Fig. 2.10) also suddenly increased after 2008, more than doubling in 2011 with respect to 2007. Between 2007 and 2011, in fact, the index registered a +102% increase. In 2013 policy uncertainty had not yet gone back to its pre-crisis levels.

Figure 2.11: Elasticity of Total Fertility Rate to Great Recession indicators. All parities and age groups.



Source: elaboration of the author based on data from Eurostat, ECB, Bank of England, OECD and Federal Reserve Economic Data (St. Louis FED), US National Vital Statistics and US Treasury. EPU index by Beker et al. (2012).

Figure 2.11 illustrates the elasticity of TFR to the four indicators (Table A1.1 in the Appendix 1 reports the detailed analysis). The top panels show the elasticity to unemployment: a 1% increase in general unemployment rate is associated to a decline in TFR the following year of 0.087%. Results for youth unemployment are very similar. Gensler (1996) found a very similar elasticity of fertility to unemployment (0.09%) for the birth rates of single-female households in the US during the nineties. Also, this value is close to the elasticity found for fertility rates to housing prices in the US (between -0.1 and -0.2) between 1997 and 2009 (Dettling and Kearney 2013).

In non-log-transformed variation, this means that for every percentage-point increase in unemployment rate, TFR declines by 0.013 births (results not shown). If we consider that unemployment rates went from 6.11% in 2007 to 10.4% in 2013 among the countries considered here, according to our estimate the increase in unemployment rate of more than 4% implied a total fertility rate average decline of around 0.05 births in the 32 countries in the sample, a 3% decline since pre-crisis TFR in advanced economies. This is comparable to estimates reported in previous studies that point to an effect of the Great Recession on TFR of around 2-5% in the US (Morgan 2011a, 2011b) and the estimate by Currie and Schwandt (2014) that estimated a 2.4% decline in complete fertility of those cohorts who experienced a rise in unemployment during the first phase of the Great Recession at the age of 20-24[67].

Looking at the proxies for more general economic uncertainty and fear (Figure 2.11 - bottom panels), sovereign debt risk seems not to be associated with fertility, at least in the complete sample of European countries and the US. An increase, instead, of 1% in the Economic Policy Uncertainty index is associated with a drop in TFR the next year of around 0.05%, around half the elasticity found for unemployment.

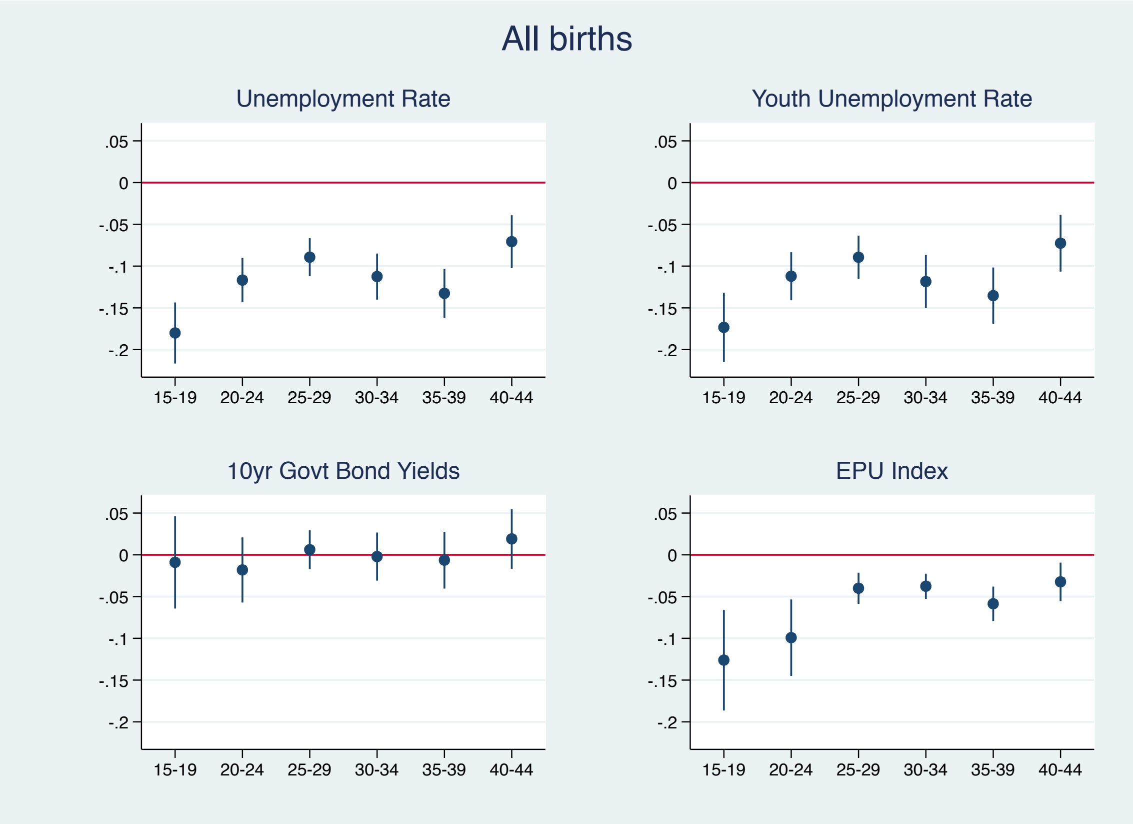
These estimates are already informative but the effect of the recession on fertility is likely to be very heterogeneous across age groups, parities and across countries (Kreyenfeld et al. 2012). These more specific estimates are presented in the next figures.

Looking at age-specific TFR in Figure 2.12, the pattern seems very robust to the different economic indicators used (except for the government bond yields that again have an effect on fertility that is substantially and statistically zero in all age groups): the largest negative impact of the crisis has been so far on very young women, followed by women in their late thirties.

A percentage-point increase in unemployment (or youth unemployment) is followed by a drop in fertility of almost 0.2% for the very young (15-19 year-old women) and of around 0.1% for women in their twenties (ages 20-29). The negative effect increases again for 30 year-old women, up to a -0.15% and is the smallest for 40-44 year-old women (-0.07%). These results are very similar to those obtained by Goldstein et al. (2013) and even a bit lager, probably because in many European countries the negative effects of the Great recession materialized later than 2011, the last year analyzed in their paper. It is thus important to include more recent years to grasp the total negative effect of the crisis on childbearing. These age-specific results are also in line with Schneider (2015) who finds a negative effect of unemployment rates declining with age groups in the US, and Lanzieri (2013) who finds for Europe an effect of unemployment only for women younger than 30 years of age (the models in those papers are very different from the present one so the magnitude of the estimate in not directly comparable). The EPU index shows the same tendency of a large negative effect for fertility at younger ages (around -0.12% at 15-19) but it shows a generally smaller effect, with respect to job market indicators, on fertility at older ages (less than -0.05% for women older than 25).

[67] However, these estimates are much smaller if compared to the elasticity of fertility to men income increase, estimated by Black et al (2013) around 0.5, even though their estimates are on completed cohort fertility.

Figure 2.12: Elasticity of Age-specific Fertility Rates to Great Recession indicators. All Parities.



Source: elaboration of the author based on data from Eurostat, ECB, Bank of England, OECD and Federal Reserve Economic Data (St. Louis FED), US National Vital Statistics and US Treasury. EPU index by Beker et al. (2012).

The effect on first births is illustrated in Figure 2.13: the elasticity to unemployment is again stronger for young women (around -0.2 for 15-19 years old) and very close to zero for women above 40. The elasticity by age group on first births is very similar to those for all births pooled together, except for 40-44 year-old women for whom unemployment rate has not affected the likelihood that they will become mothers. These women are close to the end of their reproductive life and if they are childless and want to have children the economic conditions might influence them less than younger women[68] (this is also confirmed by the estimates on second births). The results for youth unemployment are again identical to general unemployment rates. The estimates for the EPU index are much less precise than before because the sample is smaller, but in magnitude the elasticity is again very similar to that found for all births pooled together. Finally, there seems to be once more no effect of long-term government bond yields on first birth rates.

[68] Specifically to this group of childless women close to the end of their reproductive life is dedicated the last empirical chapter of this thesis (Chapter V).

Figure 2.13: Elasticity of Age-specific Fertility Rates to Great Recession indicators. Parity one.

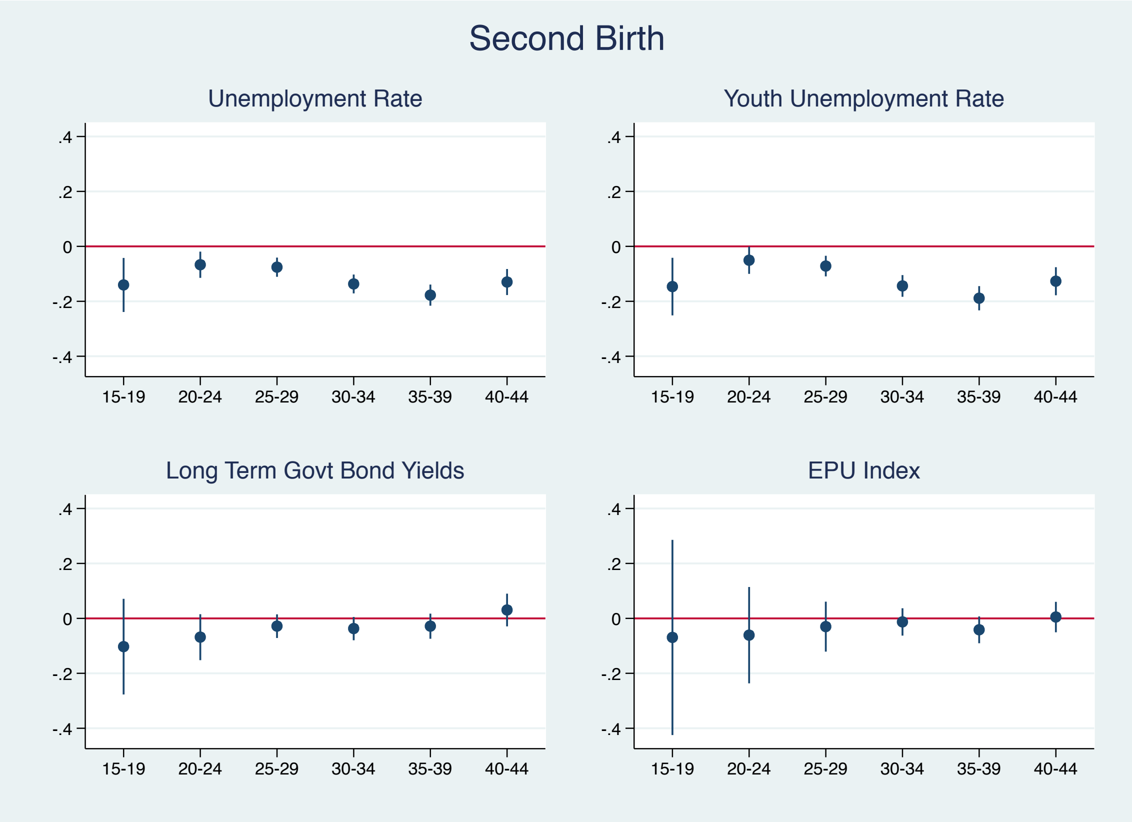
Source: elaboration of the author based on data from Eurostat, ECB, Bank of England, OECD and Federal Reserve Economic Data (St. Louis FED), US National Vital Statistics and US Treasury. EPU index by Beker et al. (2012).

The elasticity of second births (Figure 2.14) is still negative but the effect in this case is larger for thirty and forty year-old women compared to women in their twenties and to the results for parity one. The range of the estimates, however, do not vary much, remaining between -0.15% for the 15-19 and 35-39 year-old women to -0.07% for women in their twenties. These results are similar to those obtained by Goldstein at al. (2013) who find a negative and significant elasticity of first births to unemployment rates only for women 30-39 around -0.05/-0.1.

To sum up, the negative effect of unemployment rates affects especially young women in their transition to motherhood, namely women that can afford to postpone their first child but, at this level of aggregation, they seem not to affect the decision of women close to the end of their reproductive lives to postpone first births[69]. Once they have had a first child, rising unemployment reduces more strongly the likelihood that thirty and forty year-old women proceed to a second child compared to women in their twenties. There is no indication of an effect of sovereign debt and policy uncertainty on second birth rates. Long-term government bonds and the EPU index are not precisely estimated and all confidence intervals cross the zero line; moreover, the point estimates for both indicators are also very close to zero.

[69] This finding is further tested in Chapter V of this thesis in the case of White American women for whom, as will be illustrated, this result does not apply.

Figure 2.14: Elasticity of Age-specific Fertility Rates to Great Recession indicators. Parity two.



Source: elaboration of the author based on data from Eurostat, ECB, Bank of England, OECD and Federal Reserve Economic Data (St. Louis FED), US National Vital Statistics and US Treasury. EPU index by Beker et al. (2012).

The next set of figures depicts the different elasticity of age-specific fertility rates to the financial and macroeconomic indicators in different geographical regions. I first separate the US from Europe and, second, within European countries I look at the diverse effect of the crisis by country clusters (North, South, West and Central-East Europe).

In the US and in the southern European countries (Fig. 2.15-2.16) the effect of unemployment on fertility was the largest, especially so among young women. A 1% increase in unemployment reduces teens' fertility rate of -0.25% while for the same percentage-point increase in youth unemployment the decline in teens' fertility rate is more than -0.3% both in the US and in South Europe (see Figure A1.3 in Appendix 1 for youth unemployment in Europe).

The difference between the two geographic areas concerns older women: while in the US women in their thirties and forties did not seem to be much affected by rising unemployment, that was not the case in southern Europe, where a 1% increase in unemployment rate still reduces fertility at 35-39 and 40-44 of 0.15-0.2% (the results for youth unemployment are identical and available in Figure A1.3 in Appendix 1).

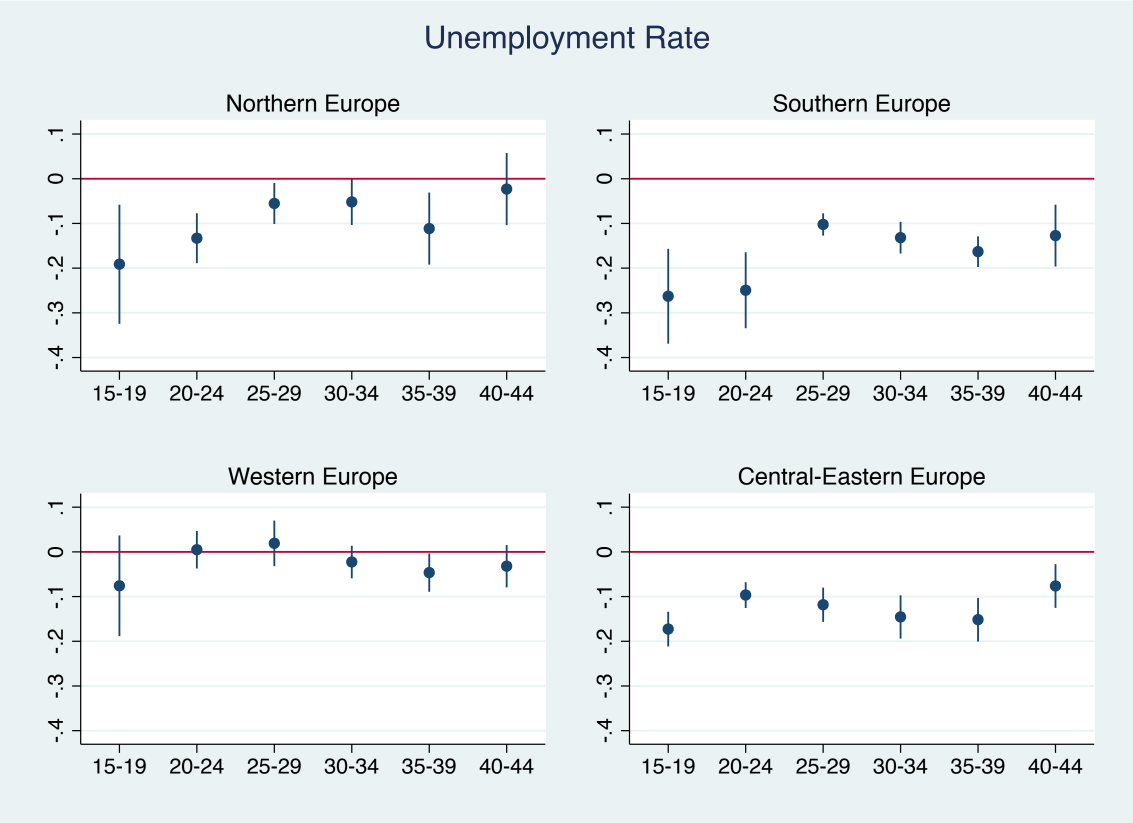
Figure 2.15: Effect of recession indicators on Age-Specific Fertility Rates in the US.

Source: elaboration of the author based on data from Eurostat, ECB, Bank of England, OECD and Federal Reserve Economic Data (St. Louis FED), US National Vital Statistics and US Treasury. EPU index by Beker et al. (2012).

Fertility rates (at any women's age) in western European countries were the least affected by unemployment rates, while both in the Nordic countries and in the Central-European countries we do see a negative effect of unemployment on fertility rates. In particular, teenagers' fertility rates reacted substantially negatively in both country clusters (elasticity close to southern Europe at -0.2%) but also 20- and 30-year-old women reacted to rising difficulties in the job market by reducing fertility in both regions. In contrast, I don't find any effect in northern Europe for women ages 40-44.

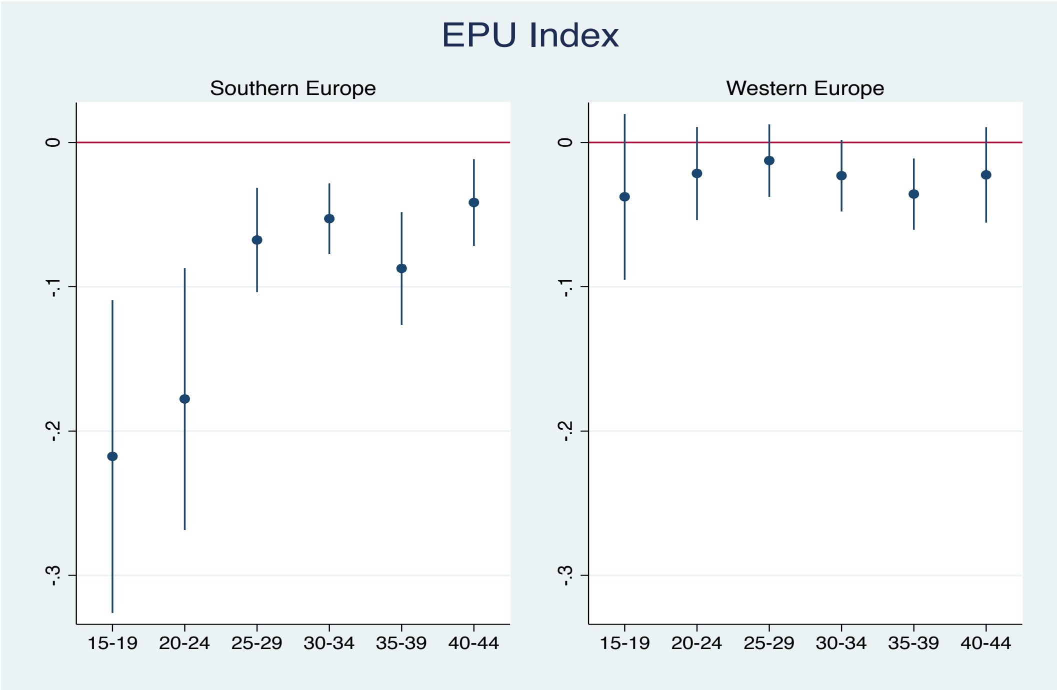
The EPU Index is available only for the US (Fig. 2.15), for Italy and Spain in southern Europe and Germany, France, UK and the Netherlands in Western Europe (Fig. 2.17). Once more the effect on age-specific fertility rates is similar in the US to the effect found in Italy and Spain, excepting the 40-44 year-old women. At younger ages the elasticity of fertility rates to a 1% point increase in the uncertainty index is around -0.2% for less than 25 year-old women and around -0.05/-0.075% for women between 25 and 40 years of age. The elasticity of 40-44 years olds' fertility is not significantly different from zero in the US while still around -0.05% in southern Europe.

Figure 2.16: Unemployment rate effect on Age-Specific Fertility Rates. Europe.



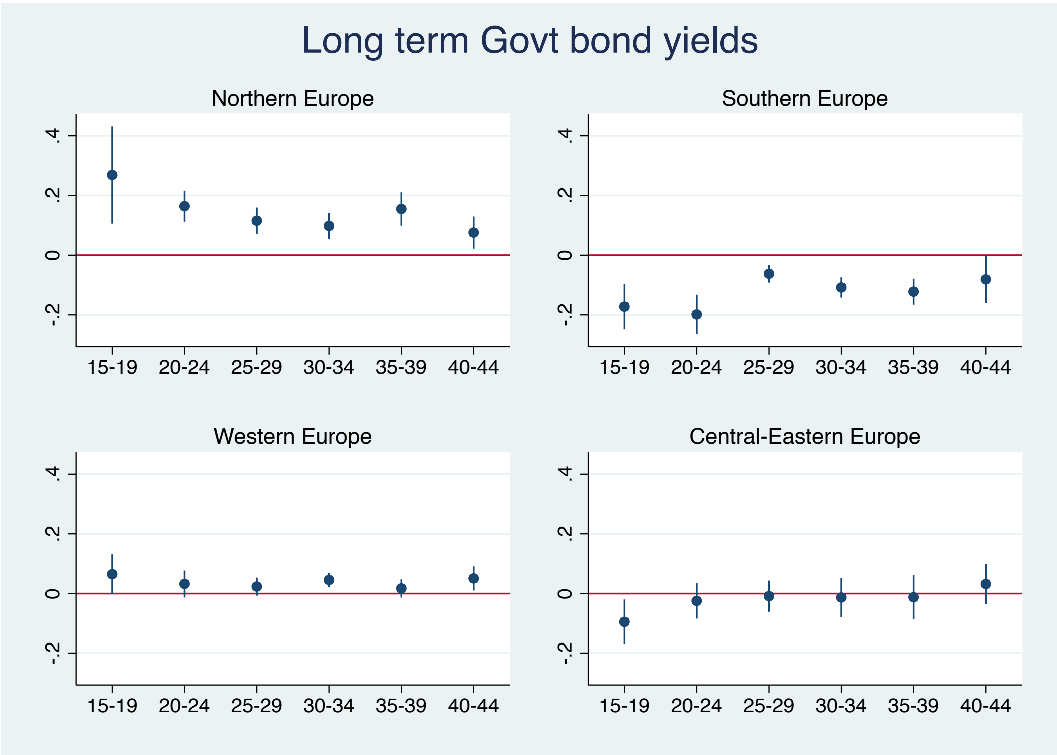
Source: elaboration of the author based on data from Eurostat, ECB, Bank of England, OECD and Federal Reserve Economic Data (St. Louis FED), US National Vital Statistics and US Treasury. EPU index by Beker et al. (2012).
Country clusters: Western Europe (Austria, Belgium, France, Germany, Ireland, Luxembourg, Netherlands, Switzerland, UK); Central-Eastern Europe (Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia); Northern Europe (Denmark, Finland, Iceland, Norway, Sweden) and Southern Europe (Cyprus, Greece, Italy, Malta, Portugal, Spain).

Figure 2.17: EPU index effect on Age-Specific Fertility Rates. Europe.



Source: elaboration of the author based on data from Eurostat and EPU index by Beker et al. (2012).
Country clusters: Western Europe (France, Germany, and the Netherlands) and Southern Europe (Italy and Spain).

Figure 2.18: Long-term governments bond yields effect on Age-Specific Fertility Rates. Europe.



Source: elaboration of the author based on data from Eurostat, ECB, Bank of England, OECD and Federal Reserve Economic Data (St. Louis FED), US National Vital Statistics and US Treasury. EPU index by Beker et al. (2012).
Country clusters: Western Europe (Austria, Belgium, France, Germany, Ireland, Luxembourg, Netherlands, Switzerland, UK); Central-Eastern Europe (Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia); Northern Europe (Denmark, Finland, Iceland, Norway, Sweden) and Southern Europe (Cyprus, Greece, Italy, Malta, Portugal, Spain).

Figure 2.18 illustrates the elasticity of age-specific fertility rates to sovereign bond yields by European country cluster. The long-term bond yields' effect on fertility rates for the US is not shown because they do not have the same financially informative role on the American economy[70].

The only country group where I do find a negative effect of the rising cost of public debt is southern Europe, where the Great Recession actually materialized as a sovereign debt crisis. Considering only the countries in this cluster, the increase between 2007 and 2011 in long-term bond yields was of more than 75% (the average sovereign bond yield was 4.49% in 2007 while it was 7.86% in 2011; see Fig. 2.4), a surge similar to that seen in unemployment rates. The negative elasticity is again stronger for the fertility rates of younger women, moderate among 30 year-old women and almost null for women 40+. The magnitude of the effect resembles that of the policy uncertainty index (EPU) and confirms that the two indicators convey a different effect of the Great Recession compared to unemployment, one more linked to the perception of economic uncertainty than to the more objective economic conditions of which unemployment is an excellent measure.

Table 2.1 concludes this first part of the analysis of the effect of the Great Recession on fertility rates by merging the results obtained separately with each indicator of the crisis (Models 1-4 show the results illustrated graphically in Figure 2.11). Country and country year fixed effect are reported in Table A1.1 in Appendix 1.

Model 5 combines all four measures I used to describe the different components of the crisis that might have had an impact on TFR in advanced economies: on the one hand, unemployment rates, conveying the deterioration of the objective conditions of the economy, and on the other hand, sovereign debt cost and an index of policy uncertainty, conveying the perception of economic insecurity and the 'fear' accompanying the Great Recession.

The results show, first, that the negative effect of rising unemployment rate on TFR is only partially reduced by the effect of economic uncertainty on TFR. Controlling for the level of uncertainty, a one-percentage point increase in unemployment rates reduced the TFR by 0.06%, a one-third reduction compared to the total effect of unemployment that was of -0.09% (Model 1). The effect of a rise in the economic policy index (EPU) is halved when we consider it together with unemployment and sovereign debt cost, reduced to a -0.02% in fertility for a percentage-point increase in the index[71].

Importantly, the R-squared is very high in all the model specifications (also due to the country and year fixed effects, and the country linear time trend controls, figured into this) but it increases to more than 0.99 in the model in which all the explanatory variables are added together. This is an indication

[70] First, they are usually countercyclical due to the role of the dollar as a safe currency during economic and financial crisis and second because the Federal Reserve more aggressively uses unconventional monetary policy measures to keep sovereign debt interest rates low (IMF World Economic Outlook 2012).

[71] Controlling for unemployment and the EPU index, government bond yields increase is actually a good thing for fertility rates and a 1% increase in the yield implies an increase in TFR of 0.04%.

that I am explaining a very large time variation in TFR in the sample that combines these independent variables.

All in all, the negative effect of the objective economic conditions on fertility rates still seems predominant in this first analysis compared to the effect of indicators of the perception of the recession, with rising unemployment rates (and youth unemployment behaving very similarly) responsible for roughly a 0.05 point decline in TFR (-3%).

Table 2.1: The Great Recession indicators effect on Total Fertility Rate in Europe and the US (2003-2013). Country and Country-year Fixed effect models.

	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)
Unemployment rate	-0.087***				-0.064***
	(-0.106 - -0.068)				(-0.090 - -0.038)
Youth Unemployment Rate		-0.086***			
		(-0.108 - -0.065)			
10 Years Govt. bond yield			0.010		0.043**
			(-0.014 - 0.034)		(0.010 - 0.076)
EPU Index (annual average)				-0.043***	-0.021***
				(-0.060 - -0.026)	(-0.036 - -0.006)
Year	0.003**	0.005***	0.004***	-0.009***	-0.004**
	(0.000 - 0.006)	(0.001 - 0.008)	(0.001 - 0.006)	(-0.012 - -0.005)	(-0.006 - -0.001)
Country FE	YES	YES	YES	YES	YES
Country*Year FE	YES	YES	YES	YES	YES
Constant	-5.447**	-8.949**	-7.153***	-36.714***	-10.309**
	(-10.893 - -0.002)	(-15.945 - -1.954)	(-11.756 - -2.551)	(-49.315 - -24.114)	(-19.675 - -0.943)
N	352	343	318	76	76
R-squared	0.967	0.965	0.965	0.989	0.993

Source: elaboration of the author based on data from Eurostat, ECB, Bank of England, OECD and Federal Reserve Economic Data (St. Louis FED), US National Vital Statistics and US Treasury. EPU index by Beker et al. (2012).
Note: *** p<0.01, ** p<0.05, * p<0.1Robust ci in parentheses. All variables are log-transformed and the independent variables are lagged one year.

6. The decline in birth rates following monthly fluctuations in unemployment, sovereign debt cost and Economic Policy Uncertainty

6.1. Method: variables, data and the sample

In this second part of the analysis I exploit the availability of monthly birth data and monthly fluctuations in those economic indicators to get a more precise view of the relationship between fertility and the variation in economic conditions. As in Section 5, I also investigate the geographical variety in the economy-fertility correlation, but add here a special focus on southern European countries that were especially hit during the sovereign debt crisis after 2010[72].

Besides the monthly variation in both dependent and independent variables, the difference between the analyses in the previous section is that first, youth unemployment is not included as an explanatory variable since the annual analysis yielded almost identical analyses between general and youth unemployment. Second, together with monthly long-term (10yr) government bond yields, an absolute measure of financial and economic uncertainty, I am now including the monthly national sovereign spread, a measure of relative instability of the national economies during the recession.

The term *spread*, defined as the difference between risky countries' long-term (10-year) bond yield and that of the safe ones – namely, Germans – has come into ordinary use in the media and public debate in Europe at the beginning of the crisis, hence becoming a source of information for the general public as well (see Sections 2.2-2.3 for more details).

It is useful then to look at how fertility reacted to variations in the spread, an increase of which represents a rise in economic uncertainty for the business community but also for households that not only might have invested a part of their savings in government bonds, but might also associate sovereign volatility with state financial distress, seeing the spread as a barometer of the economic condition of the country.

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[72] The initial increase in the spread between the long-term interest rates in Italy and Germany is to be dated to September 2011 when a third version of the so-called '*Manovra bis*' containing austerity measures was approved by the Parliament, while Mario Draghi announced that Italy was running a high risk and the BCE could not guarantee that it keep buying Italian government bonds. The situation escalated in November 2011 when Berlusconi's government was forced to resign, largely because of the extremely negative perception of his government on the international markets. The 10-year yield peaked at that time at 7.06%, and gradually declined afterwards to around 2.6% in February 2013, even if the political elections results of the end of the month created instability on the markets, making the spread with the German bond yield fluctuating quite a lot (after being steady around 4-4.5%, it was at 3.2% in April 2014, and slightly above 2 today).
In autumn 2012 "Spain replaced Greece, Ireland and Portugal as the main focus in the euro zone debt crisis after its crippled banks, highly-indebted regions, a second recession in three years and soaring debt unnerved investors", as Reuters reported in October. The country's borrowing costs had reached levels deemed unsustainable in the long run, that peaked in July 2012 at 6.8% after Madrid received a €100 billion aid from its Eurozone counterparts in June to support its financial sector. Regarding the first months of 2013, the yield was around 3.6% (March 2013), even if the party funding scandal involving Prime Minister Rajoy, and the revival of the Catalan secessionist debate, had induced fluctuations in the interest rate the previous month.

The dependent variable is now the General Fertility Rate (GFR), which is the number of monthly live births divided by the number of women 15-44 years old (multiplied by 1000)[73].
Again I have 31 European countries for which Eurostat publishes monthly fertility, employment and public finances data, plus the US. As before, the EPU index is only available for the US and six European countries. All independent variables are lagged 9 months and all variables are log-transformed.
In all models I included a linear yearly time trend, a country fixed effect and a monthly fixed effect to capture the seasonality in births. Since this seasonality in births varies strongly across countries I included in all models an interaction between country and month. The estimates of the interaction terms are left out of the table for ease of reading (complete tables are available in Appendix 1).

[73] This is a more accurate measure compared to birthrates, the number of monthly live births divided by the number of all women (any age).

6.2. Results

Table 2.2 shows the country-months fixed effects models of the impact of the financial and economic indicators on monthly birth rates (for the complete estimates see Table A1.2 in Appendix 1). The point estimate in Model 1 shows that results are very similar to those obtained with yearly data: for an increase of 1% in unemployment rate (lagged 9 months), the birth rate per 1000 women 15-44 decreases by 0.085% (it was 0.087% in the annual analysis). In non-log transformed form (not shown) this translates into a drop in the GFR per 1000 women 15-44 of 0.42, for every percentage point increase in unemployment rate. In a similar analysis, but for the US alone and based on annual estimates, Schneider (2015) finds a similar effect of unemployment rate on the general fertility rate of -0.60 births per women 15-45.

For an average increase in unemployment of 4% this means a reduction in GFR of 1.68 births per 1000 women 15-44. Since between 2008 and 2013 the GFR went from 55.1 births to 52.6 births (see Fig. A1.3 in Appendix 1), out of this total decline of 2.5 births per 1000 women 15-44, the rise in unemployment seems responsible for a 70% (1.68/2.5) of it.

Models 2 and 3 present the estimate for long-term government bond yields, and the derived spread between national bond yields and the secure German bonds. As already seen in the yearly analysis, the negative effect of the Great Recession channeled by the debt crisis was concentrated in southern European countries, and this is probably why in Models 2-3 we get a very small effect on births of the increasing cost of public debt. This will be clearer later on when I repeat the analysis by country and country clusters.

Model 4 looks at the effect of the EPU index (only for the available countries): for a 1% increase in the EPU index birth rate per 1000 women 15-44 decreases of 0.01% (it was 0.043% in the annual analysis). The difference with the annual setting estimate for the EPU index (for instance compared to unemployment for which the point elasticity are very similar in the two model specifications) is due to the fact that the uncertainty index has a much larger month-to-month variation compared to the unemployment rate.

Table 2.2: Elasticity of monthly fertility rates to macroeconomic indicators of the Great Recession. 31 European countries plus the US. OLS with country and month fixed effects (2003-2013).

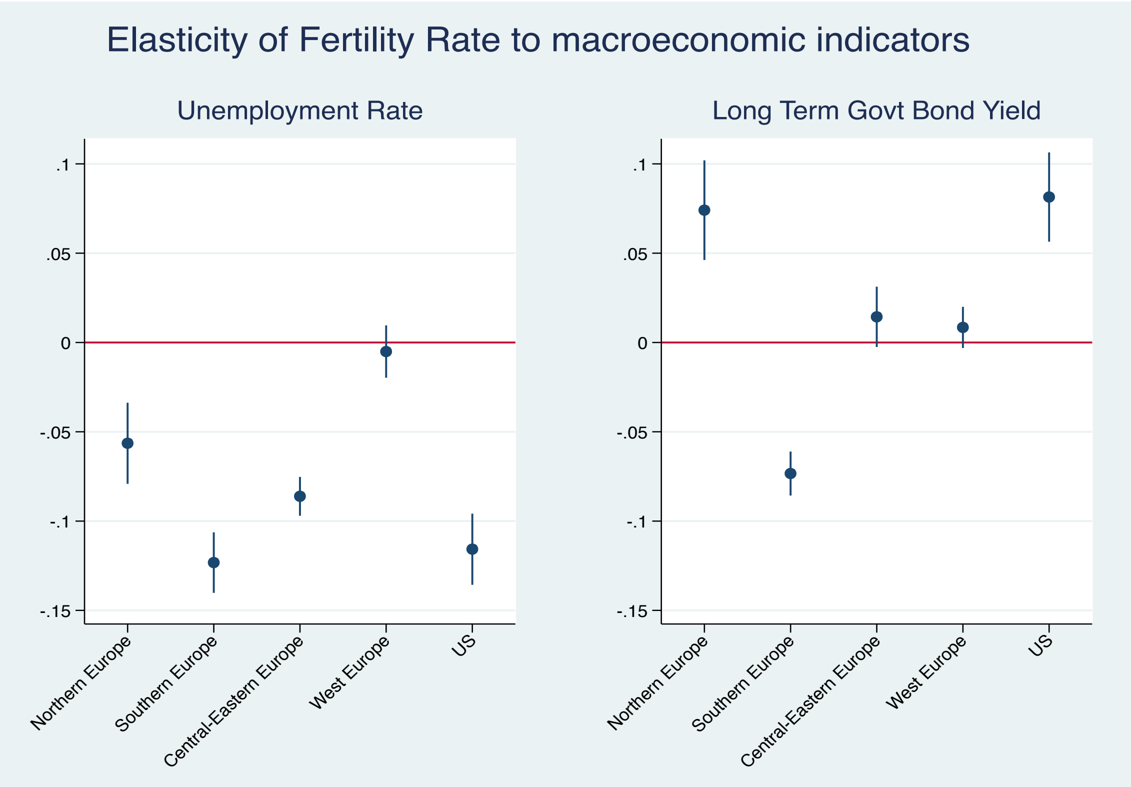
	Model (1)	Model (2)	Model (3)	Model (4)
Unemployment rate	-0.085*** (-0.092 - -0.077)			
10y Govt Bond Yields		-0.008* (-0.017 - 0.000)		
Spread in Bond Yields			-0.006*** (-0.009 - -0.004)	
EPU index				-0.011*** (-0.018 - -0.004)
Year	0.007*** (0.006 - 0.008)	0.004*** (0.003 - 0.005)	0.005*** (0.004 - 0.007)	0.003*** (0.001 - 0.004)
Country FE	YES	YES	YES	YES
Month FE	YES	YES	YES	YES
Country*Month	YES	YES	YES	YES
Constant	-10.400*** (-12.039 - -8.761)	-4.594*** (-6.286 - -2.902)	-7.221*** (-9.612 - -4.831)	-1.168 (-3.504 - 1.168)
N	4,181	4,004	3,503	898
R-squared	0.857	0.841	0.830	0.945

Note: *** p<0.01, ** p<0.05, * p<0.1. Robust CI in parentheses. In Model 2 the fertility and the unemployment rates are not logged.
Source: elaboration of the author based on data from Eurostat, ECB, Bank of England, OECD and Federal Reserve Economic Data (St. Louis FED), US National Vital Statistics and US Treasury. EPU index by Beker et al. (2012).
Country clusters: Western Europe (Austria, Belgium, France, Germany, Ireland, Luxembourg, Netherlands, Switzerland, UK); Central-Eastern Europe (Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia); Northern Europe (Denmakr, Finland, Iceland, Norway, Sweden) and Southern Europe (Cyprus, Greece, Italy, Malta, Portugal, Spain).

The latter findings illustrate the average negative effect of the Great Recession on GFR, but within European countries there is a large variation that is worthwhile exploring also at this month-level analysis. Figure 2.19 illustrates the difference in elasticity of fertility to unemployment and interests on public debt, across European country clusters and for the US. The largest negative effect of rising unemployment rates was registered in southern European countries, where the estimate is very similar to that of the US, at around -0.12. For every percentage point increase in unemployment rates, the GFR declined by 0.12%, a rough 30% more negative effect compared to the country average effect of -0.085%.

Western European fertility rates seem barely affected by unemployment rates, while in Northern European and Central-eastern European countries the elasticity is between -0.05% and -0.1%.

Figure 2.19: Elasticity of fertility rate to unemployment rate and long-term government bond yields by European country clusters and the US. Country and month fixed effects (2003-2013).

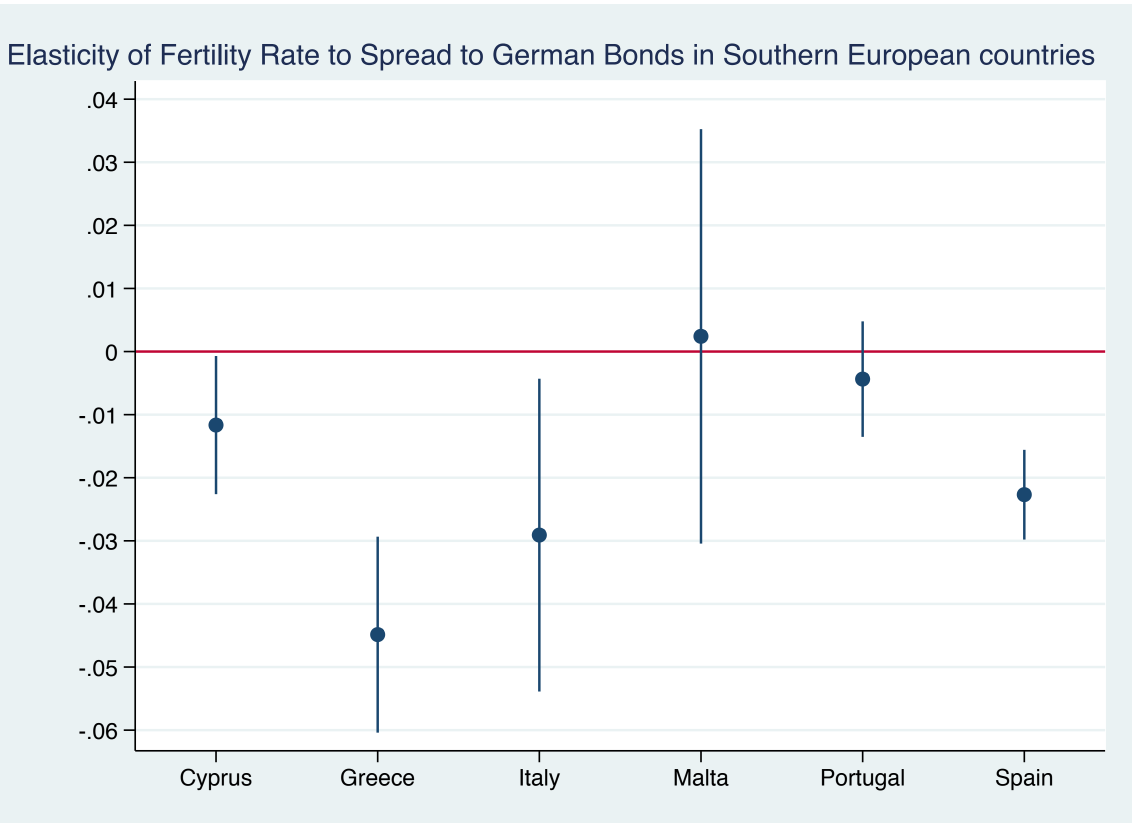


Source: elaboration of the author based on data from Eurostat, ECB, Bank of England, OECD and Federal Reserve Economic Data (St. Louis FED), US National Vital Statistics and US Treasury. EPU index by Beker et al. (2012).
Country clusters: Western Europe (Austria, Belgium, France, Germany, Ireland, Luxembourg, Netherlands, Switzerland, UK); Central-Eastern Europe (Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia); Northern Europe (Denmark, Finland, Iceland, Norway, Sweden) and Southern Europe (Cyprus, Greece, Italy, Malta, Portugal, Spain).

As also shown in the analysis by years in the previous section, the negative effect of the increase in long-term interest rates on public debt on fertility rates, is present only in southern European countries, where the sovereign debt crisis actually hit harder (see Fig. 2.18 and 2.19). The right panel of Figure 2.19 indicates that a one-percentage point increase in 10-year bond yields is associated with a decline in GFR of around 0.07% in those countries, which is comparable in magnitude to the effect of unemployment rates in the entire sample. For the Nordic countries and in the US we find an effect of the same magnitude, but positive. There is basically no relationship between sovereign bond yields and fertility in western and central-eastern European countries.

Figure 2.20 illustrates the elasticity of the GFR to the relative measure of sovereign financial uncertainty, namely the spread between southern European countries' bond yields and the Germans' (for the similar plot for 10y Govt. bond yields see Figure A1.5 in Appendix 1). The graph depicts the effects by country to give a more detailed picture of the heterogeneity of the relationship between the crisis and fertility rates. While there is no significant effect of a rise in the spread on the GFR in Malta and Portugal, I do find a negative correlation in Cyprus, Greece, Italy and Spain. Even though the magnitude of the elasticity is smaller compared to other macroeconomic indicators, ranging from around -0.05% in Greece to -0.01% in Cyprus, the potential total effect on fertility is not that much smaller, given that in those countries the spread increased much more than unemployment. The Greek sovereign risk, for instance, grew so large that the monthly spread with the German bond yields multiplied 27 times between 2009 and 2012. The elasticity of -0.05 of GFR to a percentage point increase in the Greek spread translates to a decline of -0.40 births per 1000 women 15-44 for every point increase in the spread. For 27 points increase in the Greek spread the GFR declined of around 11 births per 1000 women 15-44. For the sake of comparison, the unemployment rate in Greece grew fourfold in the observed period (from around 7% to 28%) and at the estimated elasticity of the GFR to the unemployment rate in Greece is of -0.21% (not shown) for every percentage point increase in unemployment. In non log-transformed correlations, for every percentage point increase in unemployment the GFR declined in Greece of -0.64 births per 1000 women, which gives a total effect of -2.6 births per 1000 women 15-44 (-0.64x4) due to rising unemployment. Greece is certainly a specific case, but these estimates suggest that the impact of the sovereign debt crisis is more than comparable in magnitude to the negative effect of structural job market conditions in southern European countries.

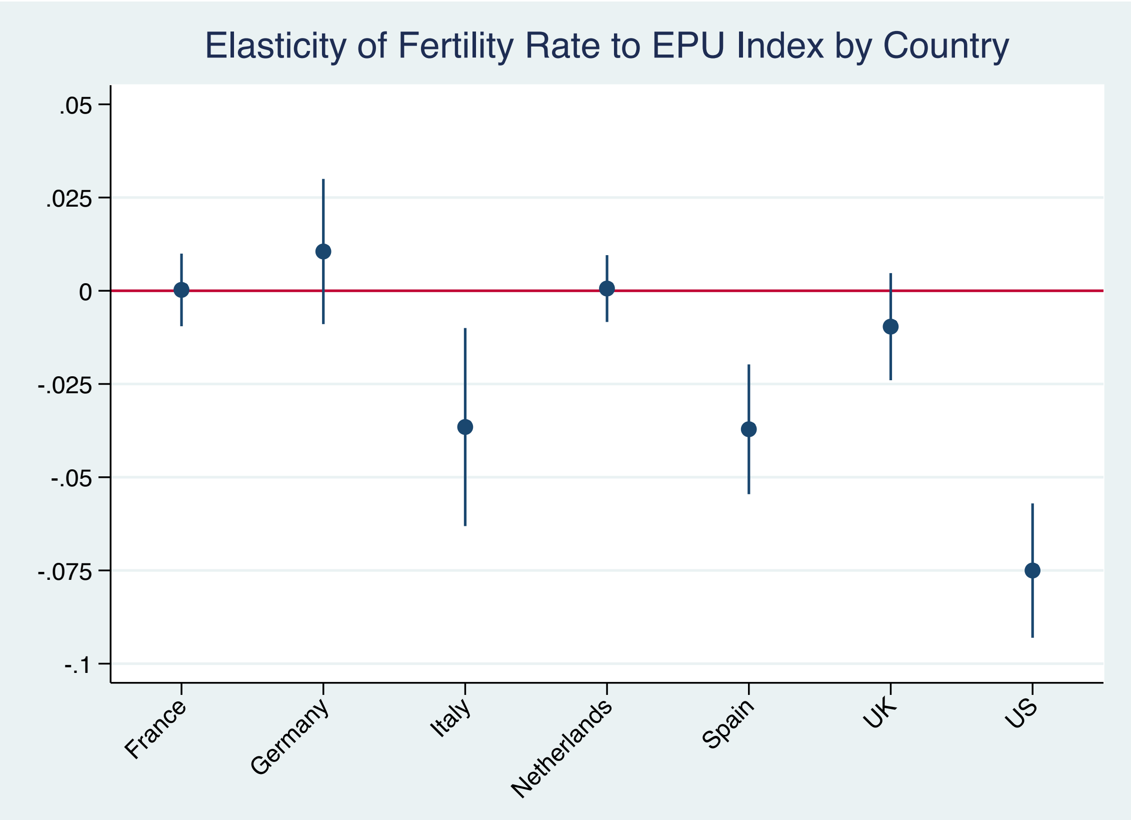
Figure 2.20: Elasticity of fertility rate to the spread of government bond yields to German bonds in Southern European countries. Country and month fixed effects (2003-2013).



Source: elaboration of the author based on data from Eurostat, ECB, Bank of England, OECD and Federal Reserve Economic Data (St. Louis FED), US National Vital Statistics and US Treasury.

Figure 2.21 shows the detailed results of the analysis on the EPU Index by country. The elasticity of the GFR to the economic policy uncertainty index is again negative in southern European countries and in the US and basically zero in continental Europe and UK. In Italy and Spain a 1% increase in the EPU Index is associated to a 0.03/0.04% drop in GFR while in the US the effect is the double, around -0.075%.

Figure 2.21: Elasticity of fertility rate to the EPU Index by country. Country and month fixed effects (2003-2013).



Source: elaboration of the author based on data from Beker et al. (2012).

Tables 2.3-2.4 conclude the analysis, as I did in the previous section, with the models combining all the indicators (for the complete models with fixed effect see Tables A1.3-A1.4 in Appendix 1). The models in Table 2.3 include the sample of countries for which the EPU Index is available (France, Germany, Netherlands, UK, Spain, Italy and the US), while models in Table 2.4 include only the southern European countries (Cyprus, Greece, Italy, Spain, Malta and Portugal). The objective is to show how all the indicators behave together in explaining the monthly variation in the GFR. Model 1 in Table 2.3 shows that the effect of unemployment rates on the GFR in these countries persists even taking into account the level of economic policy uncertainty, and the magnitude of the effect also does not change compared to the entire sample of 32 countries (see Model 1, Table 2.2).

The reverse is not true: once I control for unemployment, the effect of the EPU index on fertility disappears (becomes positive and not statistically different from zero). Once also long-term government bond yields is added (Model 2) – taking out the US of the sample because, as mentioned, sovereign bonds cannot be equated to the European ones as a public financial sustainability measure – the effect of unemployment declines a bit but remains negative and significant statistically and in magnitude. The point estimate of economic policy uncertainty remains small and not statistically different from zero while a sovereign bond yield increase is associated with a decline in GFR, even though the effect is not statistically significant (-0.011).

Model 3 in Table 2.3 substitutes government bond yields with their spread to the German bonds. Results only slightly change: the negative effect of unemployment rate and both the point estimates of the EPU index and the spread remain unchanged, even though the latter are here statistically different from zero[74].

Focusing on southern European countries only (Table 2.4) also shows that long-term government bond yields still have a negative impact on fertility after controlling for the objective conditions of the labor market (the elasticity is -0.026% in Model 1) while their value relative to the German bonds does not[75] (Model 2). Results further show that the effect of unemployment rates on fertility is larger than in the complete sample, a 1% increase in unemployment reduces the GFR by around 0.11-0.13%, even controlling for sovereign debt risk.

For the sake of completeness, Models 3-4 show the estimates when we restrict the analysis to the years of the sovereign debt crisis (and afterwards) in southern European countries. Here we witness a decline in the elasticity of fertility to unemployment and an increase in the importance of financial uncertainty measures. The monthly GFR reacts negatively to rising sovereign risk, similarly, as expected, if we look at bond yields or their spread to the Germans. The elasticity of the birth rate is around -0.02/0.04 for each percentage point increase in public interest rates after 2010.

It is difficult to interpret the magnitude of these estimates in a more substantive way because of the complexity of the models, with country, month and country-month fixed effects. Moreover, the sample of countries for which the EPU index is available is very heterogeneous, which complicates the comparison to the group of southern European countries. However, to sum up, controlling for country, time trends, and fertility seasonality we can say that: first, the effect of unemployment on birth rates is very persistent and robust in magnitude across models; second, that the perception of uncertainty also negatively influences fertility rates but that, third, the elasticity of fertility to the objective conditions of the job market is larger compared to the perceived financial and economic climate, at least in the way I measured the latter here. The elasticity of the GFR to unemployment rate is, in fact, generally five-to-eight times larger (depending on the model specification) to that of

[74] Results are robust to the exclusion of Germany from the sample.

[75] This is also evident comparing the two plots of the elasticity of fertility to the spread *versus* government bonds by countries (respectively in Fig. 2.20 and Fig. A1.5 in Appendix 1) where the latter is much larger.

sovereign risk and economic policy uncertainty. This does not mean that that the total effect on fertility rates of the two is not similar, given the different range of variations of each variable in the period 2003-2014, as explained earlier in this section.

Table 2.3: Elasticity of monthly fertility rates to macroeconomic indicators. Complete models on EPU Index sample.

	EPU sample		
	Model (1)	Model (2)	Model (3)
Unemployment rate	-0.085***	-0.071***	-0.062***
	(-0.096 - -0.074)	(-0.082 - -0.060)	(-0.076 - -0.048)
EPU index	0.005	0.005	0.006*
	(-0.002 - 0.012)	(-0.002 - 0.012)	(-0.001 - 0.014)
10y Govt Bond Yields		-0.011	
		(-0.023 - 0.002)	
Spread in Bond Yields			-0.011***
			(-0.014 - -0.009)
Year	0.004***	0.004***	0.008***
	(0.003 - 0.005)	(0.003 - 0.006)	(0.006 - 0.009)
Country FE	YES	YES	YES
Month FE	YES	YES	YES
Country*Month	YES	YES	YES
Constant	-4.163***	-4.605***	-11.032***
	(-6.345 - -1.980)	(-6.946 - -2.264)	(-14.210 - -7.855)
N	898	775	636
R-squared	0.959	0.954	0.944

Note: *** p<0.01, ** p<0.05, * p<0.1. Robust CI in parentheses.
Source: elaboration of the author based on data from Eurostat, ECB, Bank of England, OECD and Federal Reserve Economic Data (St. Louis FED), US National Vital Statistics and US Treasury. EPU index by Beker et al. (2012).

Table 2.4: Elasticity of monthly fertility rates to macroeconomic indicators. Complete models on Southern European countries.

	Southern sample			
	Entire period 2003-2014		After 2010	
	Model (1)	Model (2)	Model (3)	Model (4)
Unemployment rate	-0.110***	-0.125***	-0.069***	-0.082***
	(-0.127 - -0.092)	(-0.144 - -0.106)	(-0.116 - -0.021)	(-0.127 - -0.036)
10y Govt Bond Yields	-0.026***		-0.038***	
	(-0.038 - -0.014)		(-0.056 - -0.019)	
Spread in Bond Yields		0.001		-0.020***
		(-0.004 - 0.006)		(-0.031 - -0.009)
Year	0.004***	0.004***	-0.013***	-0.007
	(0.002 - 0.006)	(0.001 - 0.006)	(-0.021 - -0.004)	(-0.016 - 0.002)
Country FE	YES	YES	YES	
Month FE	YES	YES	YES	
Country*Month	YES	YES	YES	
Constant	-4.178*	-3.319	29.869***	18.046**
	(-8.480 - 0.123)	(-8.541 - 1.903)	(12.737 - 47.001)	(0.515 - 35.578)
N	782	777	332	332
R-squared	0.674	0.670	0.727	0.726

Note: *** p<0.01, ** p<0.05, * p<0.1. Robust CI in parentheses.
Source: elaboration of the author based on data from Eurostat, ECB, Bank of England, OECD and Federal Reserve Economic Data (St. Louis FED), US National Vital Statistics and US Treasury. EPU index by Beker et al. (2012).

7. Conclusions

This first empirical chapter describes the recent macro trends in fertility rates in the United States (US) and in Europe and argues for a relationship between the substantial and diffused decline in fertility and the financial and economic crisis that has plagued western countries in the last years five-to-eight years.

The Great Recession, as described in Section 2 of this chapter, hit Europe a bit later and for longer than the US, but it has been equally strong on both sides of the Atlantic. The financial roots of the crisis were the same and the consequences for the real economy have been dramatic.

The banking sector, in dramatic shortage of liquidity, stopped giving credit to individuals and firms, and to grant mortgages. As a consequence firms, who couldn't borrow money from banks, were not able to grow, invest and hire. Internal and external demand plummeted and firms found themselves with large amounts of unsold stock. Having to reduce production to compensate for the lower demand, non-closing firms had to lay off some, and sometimes many, of their employees and unemployment quickly reached unprecedented levels, especially among young adults with less experience on the labor market. The housing market collapsed and house-owners saw house prices dropping sharply together with the values of their properties.

The Great Recession hit households at the very heart of their finances. Meanwhile governments, in sustaining the financial sector and the real economy, had to inject money into the banking system and in social security cushions, forcing their debt to grow so much that, as a spiral, the financial markets doubted that they could ever repay it. Interest rates on European sovereign debt skyrocketed, leaving room for a speculative attack on the weaker countries like Greece, Spain, Ireland and Italy.

This has been the longest and strongest recession since the Great Depression of the thirties and it is hard to deny that economic shocks of this dimension do not impact on family dynamics.

In fact, of the 36 countries (see Figure 2.8 in Section 3 of this chapter) for which Eurostat publishes updated data - plus the US - 23 registered a decline in fertility between 2008 and 2012, six registered no change and in only seven of them the TFR increased. The 28 European countries had on average a total fertility rate in 2013 of 0.06 children, which is lower than in 2008.

These are substantial declines, especially in light of the fact that they happened after a period, at the beginning of the century, of recuperation of births, common to most western countries, and it is difficult to attribute them to a general declining trend in fertility and not the economic downturn that hit those same countries. Moreover, analyzing macro data in detail, as done in this chapter, the negative correlation between economic shocks, whether they are measured with annual or monthly variation, using objective economic conditions or indicators of economic uncertainty, and fertility measures, Total or General Fertility Rate, is evident.

All in all, the findings of the analyses suggest that the largest negative effect on fertility rates is due to the deterioration of labor market structure. The sharp increase in unemployment (general and youth) rates characterizing the recession reduced the Total Fertility Rate on average in the 32 advanced economies of 0.05 births, a 3% decline since the beginning of the crisis. Moreover, the total average increase in the unemployment rate in Europe and in the US (around 4%) explains the 70% of the reductions in the general fertility rate that dropped from 55.1 births in 2008 per 1000 women 15-44, to 52.6 births in 2013. This result is very similar to those of analogous studies conducted in the US (Morgan 2011a, 2011a; Schneider 2015).

At the aggregate level, the largest negative effect of the crisis on fertility rates was registered among very young women, 15-24 years old, while the effect was mild for women older than 40. This is especially true for first births, while older women were more likely to renounce to their second child because of the crisis, compared to their younger counterparts.

In a cross-country comparison, rising unemployment rates had a much stronger negative impact on fertility rates in southern European countries and in the US, compared to the other regions in Europe. For every percentage point increase in unemployment rates, the GFR declined in the US and southern Europe by 0.12%, a rough 30% more negative effect compared to the entire sample average effect of -0.085%.

It is more complicated to identify accurate indicators of how economic insecurity is perceived beyond the objective characteristics of the economy, and I cannot be sure that I picked the best ones. I selected the EPU Index because it is comparable across different countries and includes together with policy uncertainty by experts also measures of media coverage of this uncertainty, which is usually one of the best barometers of how private individuals perceive the economic climate and future development. I also selected indicators of the sovereign debt risk as the latter became a distinctive feature of the last phase of the Great Recession in Europe.

The elasticity of fertility rates to these uncertainty indicators is milder compared to unemployment but still negative and significant in most model specifications. The R-squared, being in most cases over 0.90, also confirms that the explanatory variables selected accurately explained the changes over time of TFR and GFR in western countries in the period analyzed. However, as said, compared to the measure of the perceived economic and financial uncertainty the fertility elasticity to unemployment is larger, more persistent over time and robust across models. In fact, in the complete sample, the elasticity of the GFR to unemployment is five-to-eight times larger than that of the sovereign bond risk and the EPU index. Moreover, the relationship between the latter and fertility disappears once we add unemployment, public debt risk and the period effect of the Great Recession to the model. Nevertheless, the negative effect on the GFR of the sovereign debt risk in southern European countries during the sovereign debt crisis is comparable to the effect of unemployment in the entire sample. The geographic specificity of the public debt crisis and the particular calibration of the EPU Index on the American case, are probably the reason why we do find a substantial effect of those explanatory variables only in specific countries.

Despite the timing of the fertility drop and its correlation to macroeconomic indicators are widely consistent with the argument that this severe economic downturn *caused* a renunciation – or at least a postponement – of childbearing, it is not possible to conclude only after these descriptive analyses that a causal link exists. I have been using the term 'effect' throughout the chapter for the sake of simplicity and because this is customary in the literature, but this does not mean that these estimates can be interpreted as purely causal[76]. Moreover, these findings do not reveal which mechanisms underlie the relationship between economic downturns and fertility behavior. The purpose of the next chapters is to fill these gaps in the preliminary findings of Chapter II, by first modeling some of the mechanisms at play - at the individual level – and, second, by determining whether there is a causal effect of the Great Recession on childbearing.

The next chapters will focus on the American experience and on the extensive margin of childbearing, namely having a baby or remaining childless. Using different research designs, datasets and quantitative methods, the investigation will focus on childless women, or childless couples, and the consequences that the economic crisis might entail for their decision to have, or not have, their first child.

In particular, the following Chapter III addresses the mechanisms of transmission of economic insecurity from the labor market domain to the family domain, and precisely to the transition to the first births. Using a panel fixed effects model on the Panel Survey of Income Dynamics (PSID) dataset, the analysis focuses on childless *couples* and their probability of entering into parenthood, conditional on the couple's employment combination and on the aggregate conditions of the US state in which they reside. The chapter further tests the existence of an interaction effect between couple-level employment conditions and aggregate macro-economic circumstances.

[76] For a more precise discussion of the topic of correlation versus causation see Chapter V where a more design-based study is applied to go into the direction of getting a causal estimate of the effect of the recession on childbearing. In the theoretical section of the same chapter the reader can find a detailed illustration of the debate on the issue.

CHAPTER III

THE INTERPLAY OF INDIVIDUAL AND AGGREGATE EMPLOYMENT UNCERTAINTY ON THE TRANSITION TO FIRST BIRTH.

1. Introduction

As illustrated in Chapter II the recent economic downturn has been, from many viewpoints, the most severe one experienced by the advanced economies since the Great Depression of the Thirties.

According to the Business Cycle Dating Committee of the US National Bureau of Economic Research (NBER), the Great Recession in the US lasted 18 months (December 2007 - June 2009), making it the longest of any recession since World War II.

In seventeen months, between June 2007 and November 2008, US citizens "lost more than a quarter of their collective net worth", and by the end of 2008 the value of savings, investments and pensions suffered dramatic losses (SEC)[77]. US demand contracted for five consecutive quarters at the record negative pace of -2.6% per quarter; the housing market was hit by a large drop in house prices (-20% by the end of 2008 since their peak in 2006) and by a boost in the rate of defaults and foreclosures (the total number of home foreclosures in 2008/2011 was of 14.1 million compared to the 3.2 million of the years 2004/2007[78]), with ownership rates consequently falling from 69% in 2004 to 66.4% in 2011[79] together with the number of new privately owned housing units authorized, which dropped from more than 2 million in 2005 to 600 thousand in 2010.

[77] http://www.sec.gov/about/secstratplan1015.pdf and the updates at http://www.sec.gov/about/sec-strategic-plan-2014-2018.pdf
[78] RealtyTrac, Federal Reserve, Equifax through http://www.statisticbrain.com/home-foreclosure-statistics/.
[79] Current Population Survey – Housing Vacancies and Homeownership.

D'Ambrosio and Rohde (2014) estimated the distribution of economic insecurity[80] in the last 15 years in the US. They found that the decline in economic security during the Great Recession was substantial and it was characterized by a sharp negative translation of the distribution. In other words, the financially insecure individuals that before the crisis were located around the mean of the distribution, moved towards more insecure positions, while the proportion of highly secure individuals did not change during the crisis. Financial shocks of these dimensions shook the economic foundations of American households and they likely affected family dynamics and fertility decisions (Harknett and Schneider 2012).

In Chapter II of this thesis, I show that birth rates sharply declined in all advanced economies after the onset of the Great Recession. Moreover, the findings of Chapter II illustrate that at the aggregate level there is a negative correlation between macroeconomic indicators of the crisis both in Europe and in the US. Births are negatively associated with increasing unemployment rates but also with an increase in economic and financial uncertainty.

For most couples, having a child and the long-term commitment associated with parenthood is linked to economic and employment security. Especially after the emergence of the economic crisis, scholars agree that economic and labor market uncertainties are important factors explaining the postponement of family formation in contemporary society (Mills and Blossfeld 2005; Sobotka et al 2011; Goldstein et al. 2013; Kreyenfeld and Andersson 2014). However, evidence on the micro-level relationship is still far from conclusive.

Advancing the argument of Chapter II, the aim of Chapter III is to investigate at the micro-level how different aspects of economic insecurity combine and affected fertility choices during the Great Recession, focusing in particular on the transition to the first child.

The term *transition* is a key concept in life-course theories (parallel and complementary to the concept of *trajectory*[81]). The latter address how historical context and structural institutions (cultural, social, economic, etc.) affect life stages and how early events influence future life decisions and paths. Within this theoretical framework, a transition represents a discrete life change that brings about a drastic change in the role or status of a person; it is usually socially organized and, especially in the past, socially ordered (Roy et al., 2014). Examples of transitions extensively studied within the life-course perspective are those from education to the labor market, the transition to adulthood (e.g. moving out of the parental home) or the transition to parenthood (Kohli 2007). The theoretical framework of life-course research motivated, and clearly also benefited from, the collection of

[80] Economic insecurity is measured as the composite of current wealth and the changes in wealth experienced in the recent past. In the article they compare insecurity in the US and Italy.

[81] The concept of trajectory emphasizes the idea, crucial to life-course theory, that events do not happen in isolation (Aisenbrey and Fasang 2010). Life-course trajectories are sequences of events and transitions, and are usually analyzed using the method of sequence analysis. Event history analysis is instead the principal method used by sociologists and demographers to analyze transitions and durations of events in the life course.

longitudinal data and the methodological development of longitudinal analysis (i.e. panel data analysis, event history analysis and sequence analysis).

The transition to the first child is one of the major life-course events. The role change implied by becoming parents is huge as are the associated responsibilities. Moreover, the age at which the transition occurs is determinant insofar as completed fertility depends on the timing of first birth. The process of postponement of parenthood of the last decades is well known and extremely well documented in the literature (Abma and Martinez 2006; Bagavos 2010; Berninger, Weiß, and Wagner 2011; Billari 2008; Billari and Kohler 2004; Blossfeld and Huinink 1991; Blossfel and Hofmeister 2006; Bonke and Esping-Andersen 2011; Boushey 2005; Breen and Salazar 2009; Budig 2003; Caldwell 1976; Esping-Andersen 2009; Impicciatore and Billari 2012; Kohler, Billari, and Ortega 2001; Lesthaeghe (1995; 2010); Matysiak and Vignoli 2008; McQuillan et al. 2008; Myrskyla, Kohler, and Billari 2009; Oppenheimer 1994; Rondinelli, Aassve, and Billari 2010; Shang and Weinberg 2013; van de Kaa 2001; Worts et al. 2013).

The major reason for the increasing mean age of women at first birth, alongside the decline in teenage pregnancies (especially in the US), is the shift of the role of motherhood in women's lives. As repeatedly reported by scholars, the multiplication of achievements of women in higher education and in the labor market (Bailey 2006; Card and Lemieux 2001; Diprete and Buchmann 2006; Fernández, Fogli, and Olivetti 2004; Goldin, Katz, and Kuziemko 2006; Lesthaeghe 1995; van de Kaa 2001), brought about an historical shift (Astin et al. 2002) in the role of women in western societies, and transformed motherhood as one of many paths that a young woman can choose.

During the nineties the hazard rate[82] of first births in the US was bimodal (Sullivan 2005), registering a first peak around 20 years of age and a second one around 28, while it became more unimodal in the first decade of the XXI century (peaking at around 29-30 years of age).

This change is due to shifting racial patterns of age at first birth, with White non-Hispanic women responsible for the second peak in the distribution during the nineties, as the leaders in the postponement of childbearing, and Hispanic White women responsible for the earlier peak and its disappearance later on when they also started postponing first births, at the end of the nineties (Sullivan 2005).

The change from bimodal to unimodal patter of first births does not seem related to education (Sullivan 2005). The hazard rates of first births greatly differed across educational levels in the nineties, with low educated women reaching the maximum probability of becoming mothers around 21 while American women with a BA or higher degree reaching such probability around the age of 30. Since then, in contrast to what happened with racial differences in age at first birth, the difference

[82] In Survival Analysis the Hazard Rate is defined as the instantaneous probability of the occurrence of an event at time *t*, conditional on the survival – non-happening – of the event until *t*. Sullivan (2005) argues that the bimodal pattern appears only if Type I First Birth rates are used instead of the more typical Type II First Birth Rates. The difference between the two rates is that the former counts first births over the number of childless women only, while the latter has all women in the denominator (a Type II measure is for instance the TFR).

across educational groups in the US has been large and is increasing, as highly educated women keep delaying their entry into motherhood (Sullivan 2005).

Very closely linked to the revolution in fertility and the increasing age at first births is the change in the marital institution. Non-marital cohabitation has become very common, whether as a primary step to later moving on to a wedding or as an alternative to it. The postponement of marriage delays childbearing, but in addition, the smaller commitment imposed by cohabitation and the increasing ease with which marriages are dissolved also negatively affect fertility by devaluing the traditional gender contract and reducing the willingness of individuals to commit to a life-plan of family and children (Ehrhardt and Kohli 2011).

Last but not least, another significant consequence of the increase in women's education is the growing difficulty they experience in finding a suitable male partner. Many childless women point to this difficulty when asked about reasons for their childlessness. First of all, women have become now more educated than men: among Millenials[83] 25-32 years of age in 2012, 38% have a bachelor's degree, compared with 31% of men; among the younger of the 18-24 year-olds, 45% women versus 38% of men are enrolled in college (2012). These educational gaps in favor of women emerged in the 1990s and have widened since then (US Census, Current Population Survey).

As a consequence, more and more women marry educationally downward: in 2012 for the first time in history the proportion of couples in which the wife is more educated than the husband is larger (20.7%) than those were husbands have higher education than their spouses (19.9%). These percentages in 1980 were respectively 10% and 20% (Wang 2014, Pew Research Center based on US census data).

The transition to parenthood is arguably one of the most demanding of life choices. It is time-intensive, and it is also financially demanding both in terms of the direct expenses of raising a child and in terms of the opportunity cost of reduced hours in the job market.

Couples are, in fact, increasingly dependent on the income of both partners and the cost of not working to stay home taking care of the children is increasingly higher, especially in societies such as the American one where many policies rely on the expectations that both parents work and support themselves through the market (Craig and Mullan 2010). Policies and norms hotly influence parenthood and in a context like the US, the normative idea that young children need constant parental care translates into policies framed in terms of childcare being the responsibility of the household. In this way the costs of childbearing are highly concentrated on parents and are not considered a public responsibility (as they are in northern European countries, which offer parental leave, state provision

[83] The terms Millennials (or Millennial Generation, or Generation Y) refers to the demographic cohort of individuals born between the early 1980s to the early 2000s. There is no precise definition of the beginning and end date of the birth cohort but the term was coined by Strauss and Howe (2000) in their book "Millenials rising: the next great generation". NY: Vintage Original. The term has now become of diffused use among journalist and academics.

of childcare, etc.). In the US the great majority of non-parental childcare is purchased on the market (the public expenditure on formal childcare in the US was 0.08% of its GDP in 2005, compared for instance to the 0.36% of the GDP of France and the 0.85% of Denmark)[84], and no paid parental leave is envisaged (Kamerman and Waldfogel, 2014). The federal Family and Medical Leave Act (FMLA) provides leave for a variety of health and family-related reasons, among which childbirth or the care of a newborn up to 12 months is included. The leave lasts up to 12 weeks in a 12-month period (taken continuously or in blocks), and is unpaid. Five states (Hawaii since 1969, New York since 1989, California since 2004, New Jersey since 2009 and Rhode Island since January 2014) have a special program (Temporary Disability Insurance - TDI) that provides a partial compensation – from half to two-thirds of earnings depending on the state – covering 10 to 12 weeks of absence from work around the time of childbirth, including four weeks before the birth and six-to-eight weeks after. The coverage of the TDI program is though only of a quarter of the labor force: FMLA applies only to employees of covered employers and who have worked for that employer for at least one year and over 1250 hours in the last 12 months. Basically, all public-sector employees, but not private employers or non-profit organizations with fewer than 50 employees, are covered (Kamerman and Waldfogel, 2014).
Only Minnesota, Montana and New Mexico have active At-Home Infant Care policies providing low-income working parents a cash benefit for the parent staying home with the newborn during the first year.

In cases where the parental leave is unpaid, parents simply do not take it. This is one of the reasons why the participation of mothers in the workforce is quite low in the US, in comparison for instance to northern European countries: 61.4% of mothers with a child younger than 3 years of age and 64.8% of mothers with children under the age of 6 work, compared to 76% and 79%, respectively, in Denmark (2011 Bureau of Labor Statistics data).[85] To put it in another way, among all mothers (children below 18 and residing in the household) 18-69 years of age, 29% are stay-at-home moms (35 million women). A growing share of them are stay-at-home mothers because they cannot find a job (6% of them in 2012 versus 1% in 2000) but it is a pattern also mirrored by the female labor force participation rate, which is stagnating after decades of growth in the US (the FLFPR was 60% in 2001 and since 2014 it has been below 57%).
Interestingly, 4% of stay-at-home mothers in the Us are so-called "opt-out moms" (Belkin 2003): women with at least a Master's degree, a family income of 75000$ and a working husband, who declare that they are out of the labor force to take care of the family (Livingstone G., 2014, Pew Research Center). To be more specific, 11% of professional-degree (medical, law, etc.) holders, 9% of Master's degree and 6% of PhD holders are opting-out. The great majority of these are White Americans (69%) but a substantial part (19%) is Asian (fewer are Hispanics, 7%, and Black, 3%).

[84] OECD's Family database. Statistics reported in the paper by Craig and Mullan (2010).
[85] Part-time employment is also not so diffused: only around the 18% of total women employed in 2011 according to OECD data.

On the one hand, the above resembles a classic work-family reconciliation problem - 69% of the opt-out mothers state they would not have stayed at home if they had more flexible work arrangements. On the other hand, the fact that in the great majority of these couples, wives are more educated than their husbands (in 37% of cases women are more educated than their partner, in 45% they are equally educated and only in 18% of the couples is the husband more educated) supports the argument that these high-achieving women are still following the traditional model of the male breadwinner (Livingstone, 2014, Pew Research Center).

However, childbearing, as a major life decision, does not depend only on the current financial position of the couple, but also, and maybe even more so, on the expected future economic conditions of the household. Changes in the aggregate circumstances of the economy and of the employment market generate uncertainty about these future conditions. In other words, macroeconomic uncertainty, boosted by the utterly negative economic outlook of the last six years, might affect fertility behavior over and above individual-level economic insecurity. A number of complementary factors whose implications are often difficult to tease out, triggered by the financial and economic crisis, alter childbearing decisions through their impact on economic uncertainty. Among them are unemployment and work instability, declining wages, the difficulty in accessing credit, the declining value of savings in the form of bonds, stock investment or housing wealth, the growing difficulties in purchasing adequate housing services or meeting daily expenses but also, more indirectly, the increasing time spent in education as a response to labor market saturation. This list is not exhaustive but highlights some of the main channels through which economic insecurity is transmitted from the aggregate business cycle's downturn to households' financial conditions.

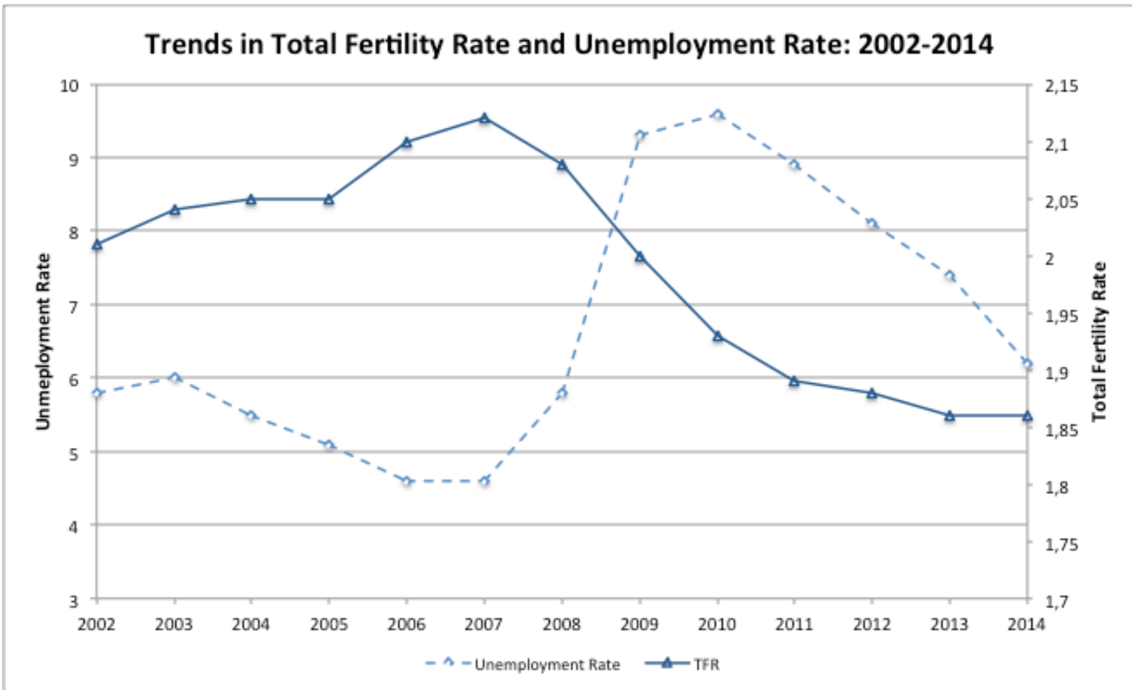
Among those, pressure on fertility is likely to come via the increase in unemployment rates and in job market instability. The Great Recession, in fact, has been associated with a marked weakening of the labor market: unemployment rates have reached and remained at high levels for months, together with the average duration of unemployment that has been unusually long. Farber (2011) documented that only in the period 2007-2009 in the US[86], 16% of people aged 20-64 reported they had lost their job and less than 50% of them were employed again in January 2010. Job losers who managed to find a new job did so relatively quickly, while those not reemployed stayed in unemployment for a long while (the mean duration of unemployment in 2010 according to the Current Population Survey (CPS) was about 35 weeks). Moreover, one among five full-time job losers had in 2010 a part-time job, and they were earning almost 22% less than in their previous job (11% if the foregone earning increase of non-job-losers is taken into consideration). On average, for both full-time and part-time workers, this decline in earnings in the new job compared to the lost job was 17.5%. This stubborn rise in unemployment and the difficulties in re-entering the labor market are very likely to have raised household economic uncertainty, and also to have borne consequences in terms of childbearing

[86] Data from January 2010 Displaced Workers Survey (DWS).

decisions.

Figure 3.1 shows together the trends in fertility and unemployment rates in the US between 2002 and 2014: the two curves are almost mirror images. As soon as unemployment starts to rise, fertility drops and the process seems to be almost simultaneous[87]. The decline in TFR is steep until unemployment starts decreasing again in 2011; then it keeps declining at a slower pace, even while the unemployment rate recuperates. Recently, unemployment has almost returned around pre-crisis levels (6% in 2014) but fertility does not show signs of recovery yet.

Figure 3.1: Unemployment rate and Total Fertility Rate in the US (2002-2014).



Source: Elaboration of the author based on data from US National Center for Health Statistics.

The principal hypothesis that is tested in this chapter is that two entwined components of economic uncertainty drive family decisions during a recession period: at the individual level, the financial or employment conditions of the members of the couple, and at the aggregate level, the economic circumstances characterizing the state, region or market in which the individuals are embedded.

Given the dimensions of the US territory and its economical and attitudinal diversity, individuals are more likely affected by state-level circumstances than by federal ones. Moreover, the macroeconomic and demographic conditions also differ across states, sometimes sharply. In 2012, for instance, 18 states registered an increase in TFR (including Idaho, Kansas, North Dakota, Texas and Ohio). These were also the states least affected by the recession and where the decline in fertility was already

87 The anticipation is probably due to the uncertainty created financial turmoil that preceded the real economy labor market effects of the crisis.

minimal or null. Contrariwise, states like Arizona, Nevada, California or Florida, where the economy was more dramatically affected, registered the largest drop in fertility rates in the last years (Klimasinska 2013).

Figure 3.2: Unemployment rates by US states in 2007, 2009 and 2012.

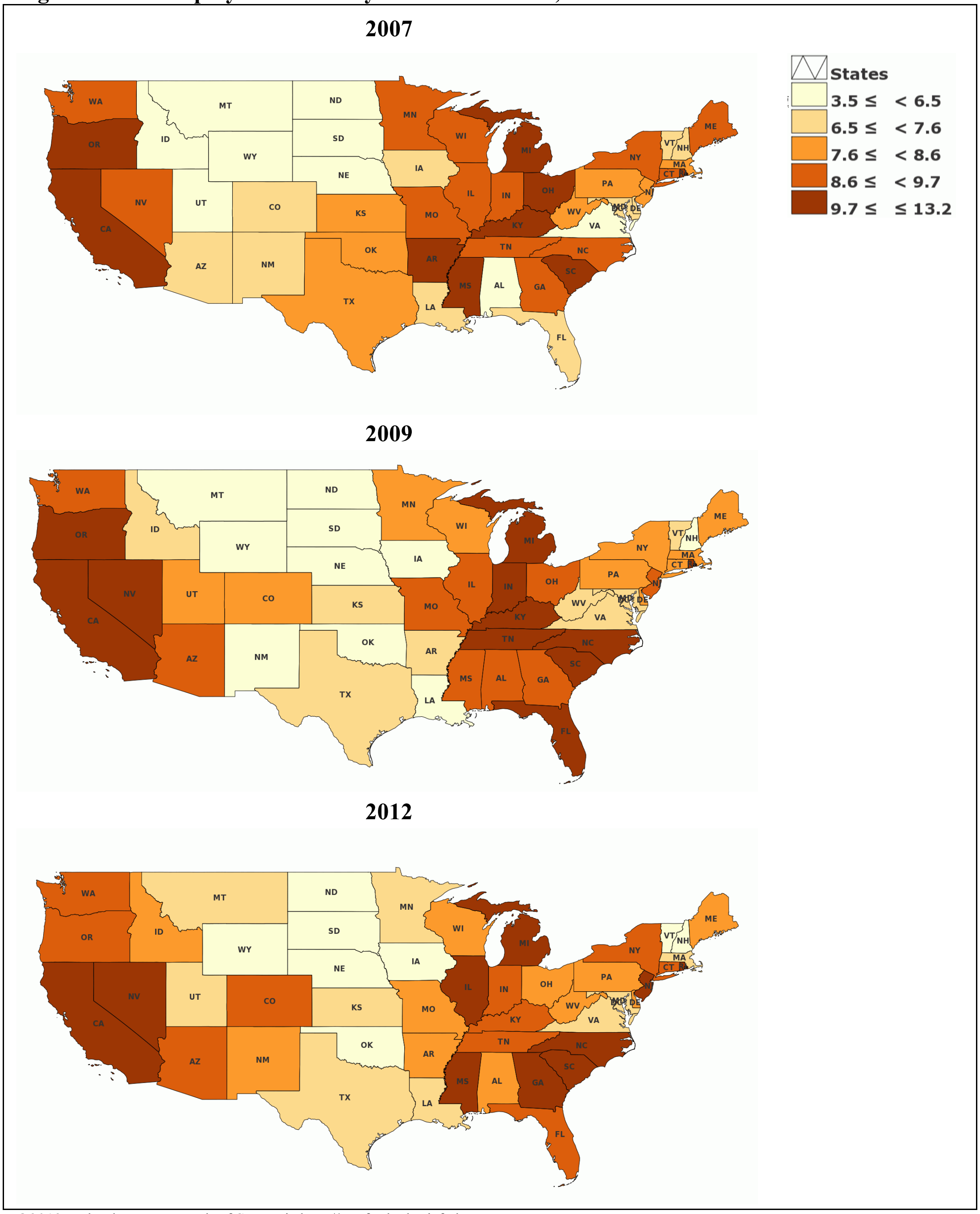


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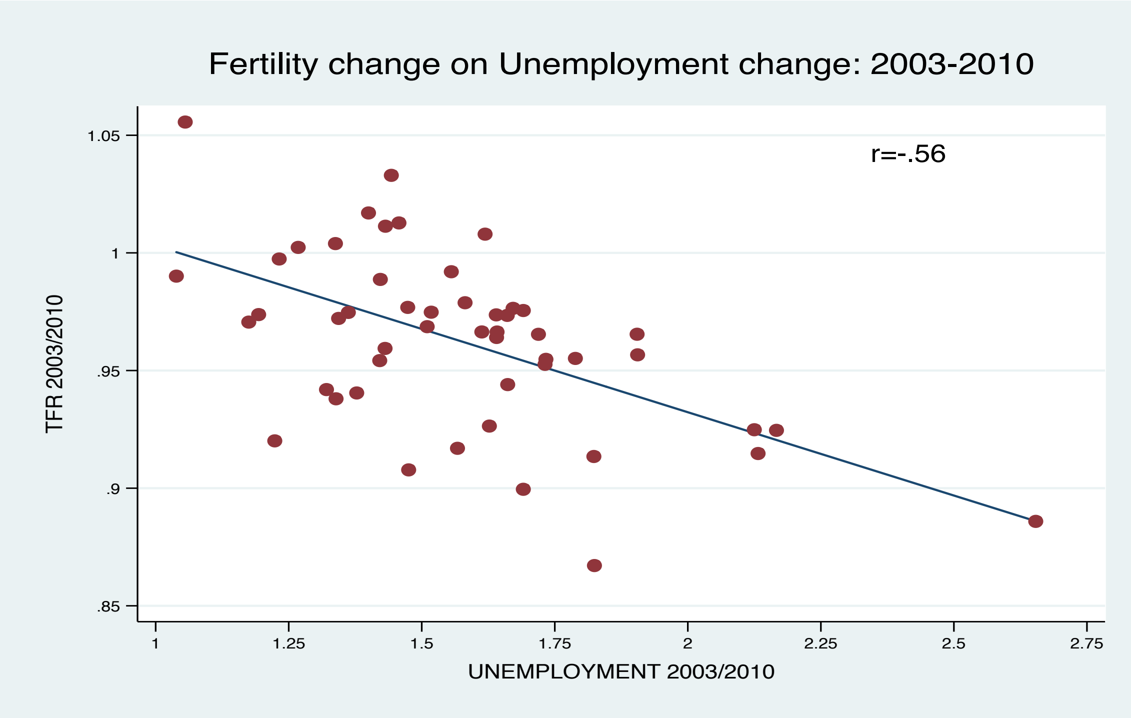
Figure 3.2 shows three maps (Federal Reserve of St. Louis) of the United States in 2007, 2009 and 2012 respectively, illustrating graphically the evolution of state unemployment across the recession (darker red color represents higher rates). As already mentioned, the regions where unemployment was higher are part of the West, e.g. California, Nevada, Oregon; part of the Midwest, e.g. Michigan, Indiana; and of the South, e.g. Tennessee, North and South Carolina and Florida. The central states of the Great Plans like Montana, Wyoming and North and South Dakota were somehow spared the major damages of skyrocketing unemployment.

In a study on the decline of fertility during the Great Recession, Morgan and colleagues (2011) found that the drop in fertility rates was larger in states that were hit more strongly by the economic downturn. Moreover, they found that the decline was bigger in the 'red states', where the voter majority is Republican, than in 'blue states', mainly supporting Democrats.
In the paper the authors argue that this was due to the Obama optimism created by the 2008 elections, dampening the negative effect of the crisis on the future economic situation. The analysis suggests that, beyond the objective financial conditions, the subjective perception of the severity of the recession matters for childbearing choices. For instance, the highest proportion of Obama/McCain vote share was 2.2 in Vermont and the lowest was 0.50 in Wyoming. The authors predict that the effect of a doubling of unemployment rates on fertility would be of +0.01 in Vermont and -0.05 in Wyoming[88].
Figure 3.3 below replicates a graph presented in Morgan at al.'s (2011) paper comparing fertility and unemployment ratios 2002/2009 (they found a negative correlation of -0.38). I repeated the analysis with more recent data, comparing the ratios 2003/2010. The result is the same: states in which the increase in unemployment rate was more dramatic are the states where fertility dropped most and the resulting negative correlation is -0.56. The same result is found by Cherlin et al. (2013) comparing the variation in fertility and unemployment between 2007/2009 for which they show a correlation of -0.50. The negative effect continued after the formal end of the recession in 2009 (throughout 2011). The authors further found that the pre-recession unemployment rate variation was uncorrelated with changes in fertility (r=-0.01).

[88] For the full analysis of Morgan et al (2011) see the online appendix 8A.1 at http://www.russellsage.org/greatrecession_onlineappendix.pdf

Figure 3.3: Total Fertility Rate and unemployment rate variation pre/post- recession by US states.



Source: Elaboration of the author based on data from US National Center for Health Statistics and St. Louis Fed.

After this introduction to the main topic of the recent trend of fertility in the US and its linkages to the Great Recession, the remainder of this chapter is structured as follows: Section 2 introduces the background of this study, the relevant theoretical and empirical literature on childbearing dynamics and the business cycle at the individual level. Most of the theoretical hypotheses and empirical findings on the impact of the recession on fertility refer, specifically, to the nexus between labor market uncertainty and first births, since it is the object under investigation in the chapter. Section 3 describes the longitudinal micro-level data (PSID) used for the analysis, and Section 4 illustrates the statistical model on which the analysis of the longitudinal dataset is based. The descriptive results are presented in Section 5 while the findings of the multivariate regression analysis are depicted in Section 6. Finally Section 7 concludes.

2. Theoretical background and empirical research review

2.1. Theoretical background

Micro-level research on fertility behavior and family dynamics has long been dominated by the neoclassical economics paradigm of rational action applied to households. This paradigm, designed by Gary Becker (1960, 1976, 1981), had couples enter parenthood (or proceed to further births) according to a maximization process based on some fixed unitary household preferences over those choices, weighting the benefits and costs entailed by those actions. Becker's (1976, 1981) model was pioneering in introducing the study of family dynamics into the discipline of economics and, perhaps more importantly, in bringing the formal modeling - typical of economics - into studies of household decision-making processes. However, Becker's model is also theoretically rooted on the traditional male breadwinner–female housewife model of household, which is typical of the mid XX century but clearly not representative of families nowadays.

Subsequent scholars of New Household Economics (NHE)[89] questioned first and foremost the original assumption of a unified household preference function, in which the household was treated as a "black box" (Pollak 1985, Samuelson 1956) and in which the dynamic of intra-household decision-making was left silent. However, the existence of separate and often conflicting preferences within the couple has been extensively documented by the literature. Assuming families are typically in harmonious agreement regarding the use of household resources (Samuelson 1956) or assuming the existence of one altruistic member who makes all the decisions for the benefit of the other members (Becker 1976, 1981) is not only simplistic but has also been shown to be inaccurate.

Given those differentiated preferences, household behavior has been theoretically investigated as a strategic interaction through the use of bargaining models (Manser and Brown 1980; McElroy and Homey 1981) according to which individual members pursue their own interests while taking into consideration the interest of others, given their relative bargaining positions inside the household. The Bargaining Model assumes diverging preferences between the two members of the couple over desired family size, and assumes further that decisions on childbearing are a product of negotiation between

[89] Together Gary Becker and Jacob Mincer founded the NHE in the sixties at Columbia University .

the two[90].

In the same direction of increasing complexity, but decisively in a more demographic than economic perspective, since the seventies, the life-course theory[91] has argued for a more dynamic and interrelated approach in the study of individual and family behavior. The main theoretical point is that individuals and their actions are embedded into specific structural, social and cultural contexts that are multidimensional and evolve over time. The life course is a social institution embracing all domains of the individual life and shaping the transitions through sequences of positions in different domains in a biographical complex perspective (Kohli 2007). As far as fertility choices are concerned, three main propositions elaborated by the scholars of the life-course approach are pertinent to the present discussion: first, childbearing choices are embedded into a multi-level structure of social dynamics (vertically), second, they are interrelated with choices in other domains of the life course (horizontally), and third, they are path-dependent; that is, present choices depend on the past and the expectations about the future (Aisenbrey and Fasang 2010).

Relatedly, modernization and demographic transitions theories (Chesnais 1992; Bongaarts 2001; Coleman 1996; Lesthaeghe 1983, 1985; Lesthaeghe and van de Kaa 1986; van de Kaa 1987, 2001) argue that the decline in fertility is part of an inevitable process stemming from the external forces of economic development, industrialization and urbanization, and leading to epochal changes in attitudes, beliefs and cultural norms.

An implication shared by all of these theories is that, if in the past childbearing was the first and often the only, source of wellbeing for certain groups in society (i.e. women), today children are only one of the many instruments of life satisfaction that individuals have. With modernization the number of options increases and parenthood competes with other, mostly economic- or work-related paths (Huinink and Kohli 2014). Women can choose between a satisfying career in the job market and a satisfying life as mothers, or they can do both.

The recent transformations in family structures in developed countries are often juxtaposed by scholars to the socioeconomic empowerment of women, the de-structuring of individual live-courses and the increasing fragility of the traditional family structure. All these changes make childbearing a more risky and expensive choice, raising the opportunity cost of motherhood and inducing parents to trade off quantity for quality with regard to their offspring. The number of children is reduced to allow the parents to dedicate more resources to each child[92][93]. The role of women and the compatibility of

[90] The outcome of the negotiation depends on one's relative bargaining power, usually measured by individual earnings. These are the resources transferable to another relationship and measure the credibility of an exit option from the current relation, in other words, the threat of leaving the relationship in case of non-agreement in the dispute.

[91] Even though the life-course perspective appears to be more of a methodological approach than a systematic theoretical framework, at least at the moment (Huinink and Kohli 2014).

[92] Besides the rational calculus of the material increase in the cost of raising a child and the change in preferences of individuals, there are also psychological reasons that reinforce this quantity-quality trade-off. For instance, evidence (Eibach and Mock, 2011) suggests that since the costs of childbearing have grown so much, parents tend to attribute more value to parenthood, and to idealize their role, to cope with the cognitive dissonance

the various life domains (i.e. work/family) have dominated the theoretical debates and empirical research on declining fertility in advanced economies in the last decades.

However, in the same way that it is conceptually wrong to take the household as a black box, it is likewise erroneous to ascribe all the responsibility of childbearing to women (Vignoli et al. 2012). In the first place, the process of expanding education is common to both genders, and the lengthening of time spent in the educational system affects in the first place family formation; thus, both men and women.

Second, despite the revolution in women's position in society and within the family, men's economic position is still crucial for both the marriage market and childbearing decisions. While scholars have tended to foreground the new economic independence of women, Oppenheimer (1988) saw in the declining economic prospects of young men during the eighties and nineties an important reason for the decline in marriage rates (Kalmijn 2011). Aggregate economic and employment uncertainty affects young men economic potential, reducing their attractiveness in the marriage market, first, because setting up a household is costly and, second, because an unstable career signals uncertainty as to whether or not the potential husband will be able to financially maintain a family[94] (Oppenheimer 1988; Kalmijn 2011).

Third, with the spotlighting of women and the evolution of their roles (Esping-Andersen 2009) short shrift has been given to the fact that several of these changes also affect men's role and behavior, and even more so they affect gender dynamics within the couple (Neyer, Vignoli and Lappegard 2010, Vignoli, Drefahl and De Santis 2012). More and more often, in fact, men also have to adjust their work schedule to meet the needs of a family with a working mother, which increases men's opportunity cost of childbearing too[95] (Hart 2015). In addition, men also face a higher risk compared to women in case of relationship break-up, since laws on parental custody generally favor mothers (Ehrhardt and Kohli 2011).

As this discussion highlights, both Becker's and the Second Demographic Transition theories predict - although supported by different mechanisms and reasons - a new equilibrium of family dynamics around low fertility, fewer marriages and large couples' instability. Whether this is correct or not is a matter of empirical research (see the next section) but both theories point to fertility decisions being crucially influenced by the pervasive complexity typical of modern societies.

The strong interdependence of life domains (family/work balance), the influence of societal and economic structural conditions, and the role of the expectations about the future, significantly affect

of the increasing cost of it. This emotionally rewarding role of parenthood in turn increases the investment in children, and further reduces the number of them parents decide to have.

93 The latter concept of quality of children was also emphasized by Becker (1991).

94 This is called the career uncertainty or career instability or immaturity hypothesis (Kalmijn 2011).

95 Even though significant gender differences exist across western countries in the degree of involvement in paid work and family caring between men and women (especially during the transition to parenthood).

households' childbearing choices. In periods of economic uncertainty especially the latter factor plays a key role in the decisional process to parenthood.

Using the life-course perspective we can categorize the theoretical mechanisms identified in the literature on the fertility response to economic insecurity into two main groups: first, the mechanisms that explain the transmission of economic uncertainty between different domains within the household (work/family) and, second, the mechanisms that pertain to the multilevel dimension of the life course (external structural economic conditions/parenthood).

Among the mechanisms in the first group, two date to Becker (1976, 1981): income and opportunity-cost effects. The income effect predicts that a recession would reduce disposable economic resources and future income streams via decreasing wealth and earnings value, or unemployment or insecure job positions. If children were normal goods, couples behaving like normal consumers would decrease consumption during periods of economic downturns and postpone childbearing.

In contrast, the opportunity cost (or price effect) of having a child consists in the lost benefits, in terms of earnings streams but also in terms of tenure, accumulation of human capital etc., of being out of the labor market while having a baby. The child penalty increases with the number of children and with the number of years out of the labor market, since it is composed of actual wage losses during maternity (or paternity) and human capital depreciation and experience loss due to work interruption. The opportunity cost also increases with occupational status and wage, and it is at the minimum in cases in which the individual is unemployed. Conversely, it is at the maximum for highly educated women as women are still the principal caregivers to children and higher levels of education imply greater wage and human capital losses. Finally, the opportunity cost is usually also large for women with unstable contracts, even though job status and wage are low, because of the precariousness of the contract and the higher risk of losing the job once entering maternity. The direction of the total opportunity-cost effect of childbearing during the Great Recession is debatable. On the one hand, during a recession, the opportunity cost of childbearing is lower than during periods of economic growth because 'there is less to lose' for those out of the labor market, but, on the other hand, for those who manage to stay in the labor market, the proliferation of precarious contracts and fragile work positions increase the opportunity cost of parenthood.

The third mechanism in the first group is more normative in nature: it has been defined as the *adverse effect* (or the *affordability clause* by Rindfuss and VandenHeuvel 1990) and reflects the fact that being unemployed or having an insecure job position might be viewed as a normatively and materially incompatible situation with entry into parenthood (see also Oppenheimer 1988). The argument is that couples postpone parenthood until they have "established a relatively solid position in the labor market" (Vignoli et al. 2012:42; Bernardi and Nazio 2005).

Finally, the fourth interesting mechanism in the first category points to an opposite positive effect of economic uncertainty on fertility. This is Friedman, Hechter and Kanazawa's (1994) theory of *uncertainty reduction.* The theory suggests that individuals facing uncertainty in the economic or working sphere might want to compensate for this insecure position by entering into parenthood, thereby increasing certainty in the personal and emotive sphere[96]. The uncertainty reduction hypothesis is still ascribable to the rational choice framework even if the predictions are in the end quite different. In their work, Friedman and collegues (1994) argue that individuals facing different kinds of economic uncertainty and pursuing 'global strategies' to overcome them might actually decide to have children to balance the public uncertainty increasing private security. In other words, the economic crisis, by increasing the level of uncertainty about future financial and employment outcomes, might encourage people to increase security in other non-pecuniary dimensions, e.g. the formation of a family or having a child.

Regarding the second group of mechanisms concerning the multilevel dimension of the life course, the interaction of the two macro- (external) and micro-levels, I am interested in testing the very simple hypotheses of whether the aggregate economic situation generated by the Great Recession amplifies or buffers the negative individual effect[97]that is predicted at the micro-level.

These two alternative mechanisms investigated in the literature are first, an uncertainty *multiplier effect* of negative aggregate employment conditions on top of an insecure financial and employment status of the individual and, second, an *attenuation effect* (Oesch and Lipps 2012) of the normative stigma of being unemployed when unemployment is a diffused condition. Whether poor individual financial and working circumstances have a larger or smaller effect on childbearing would then depend on the context in which the couple lives. For instance, being unemployed among many people unemployed, by increasing the risk of staying out of the labor market for a long time, could make it even more stressful or, conversely, being unemployed when this is the norm might buffer the stigma and the feeling of distress typical when one is out of the job market. Depending on which cross-level mechanisms prevail, the consequences on childbearing decisions of individual insecurity might be more or less negative compared to the non-crisis period.

[96] Specifically, Friedman et al. (1994) suggest two alternative behavioral mechanisms. On the one hand, one might transform the problem of uncertainty into risk by gathering information and delaying parenthood until one exits from unemployment. On the other hand, one might pursue global strategies to reduce uncertainty in entire paths of future courses of action, as described above, through parenthood (Inanc 2015).

[97] For simplicity I assume that the effect of individual economic insecurity is negative for fertility (as three out of four mechanisms above point to).

2.2. Empirical research

Evidence on couples' decision-making processes shows a decline over time in gender specialization within the household (at least before first birth) and a strong increase in assortative mating in education, preferences and tastes (Blossfeld and Drobnic 2001; Esping-Andersen 2009). Moreover, with the reshaping of gender-based roles, the bargaining process between the two members of the couple becomes more and more the norm (Testa, Cavalli and Rosina 2012, 2011).

Whether the prediction of an inexorable process of nuclear-family shrinkage put forward by Becker (1976, 1981) in his theory that the benefits of marriage and parenthood lie in gender specialization,[98] and by postmodern scholars of the SDT, who adduce attitudinal changes towards the institution of the family, is valid nowadays is still an open question.

From cross-country studies (McDonald 2000, 2006; Esping-Andersen 2009; Wood, Neels and Kil 2014) it does not seem so. In highly egalitarian countries, like those in the nothern European, fertility rates are much larger than in southern European countries, where the traditional male-breadwinner model (gender specialization) is still dominant (Myrskyla, Billari and Kohler 2011). At the aggregate level, we also have witnessed a reversal from negative to positive in the correlation between fertility rates and economic development and income and female labor force participation rates (Ahn and Mira 2002; Billari and Kohler 2004; Myrskyla, Kohler and Billari 2009).

At the micro-level, the same appears when looking at educational differentials: highly educated couples that are the frontrunners in the gender equality revolution, tend to reduce fertility less today compared to poorly educated couples, where the tranditional gender model dominates (Chesnais 1996; Kravdal and Rindfuss 2008; Caltabiano, Castiglioni, and Rosina 2009; Esping-Andersen 2009; Livingstone et al 2010; Neels and De Wachter 2010; Hazan and Zoabi 2011; Thévenon 2011; Esping-Andersen and Billari 2015). An example is the study by Hart (2015) who investigates whether in more gender egalitarian societies, i.e. Norway, a positive correlation between women's earnings and first births emerged (and increases over time) while the same correlation becomes less positive for men, if the opportunity cost of fatherhood increases. The author finds support for the hypothesis with regard to women (higher earnings are positively correlated with higher odds of motherhood) but he does not find that the opportunity cost for men is increasing over time.

However, in other studies couple specialization still positively correlates to fertility (Zhang and Song 2007), and to the differentials in wages of husbands and wives too. Zhang and Song (2007) illustrate the argument, explaining the fertility differentials between married and cohabiting couples in

[98] Becker's (1981) economic theory of comparative advantage is not the only existing theoretical argument on couples' specialization; other theories point to socialization or structural constraints that lead couples to adopt the male breadwinner model (Kohli 2007).

the US. The former, they argue, have more children, not because of a selection mechanism into marriage, but because of the greater comparative advantage of gender specialization (Becker 1981) in marriage than in cohabitation.

Rondinelli, Aassve and Billari (2010) also show that in Italy women's wage (potential, based on educational attainment) negatively correlates with the timing of first birth. Women with higher wages and thus a larger opportunity cost, delay motherhood (and also reach a smaller complete fertility) with respect to low-wage women, even controlling for institutional and cultural factors.

Finally, Kalmijn (2011) investigates the impact of men's income and employment insecurity on marriage and cohabitation in Europe. He finds support for Oppenheimer's theory (1988) that men's economic and employment uncertainty deter union formation. Marriage, compared to cohabitation, is particularly negatively affected by employment insecurity. However, men's income and employment positions have a larger effect in traditional compared to more egalitarian European societies. This would suggest a tendency over time of a reduction of the impact of men's status on marriage (and consequently for fertility) when gender roles become more symmetrical.

What is certainly clear is that all these arguments speak in favor of couple-level research where men and women's economic standing is analyzed simultaneously (Kalmijn 2011). Nonetheless, the latter is still an exception in the fertility literature, with many studies focusing instead on men, or on the relationship between women's changing role within and without the household, and fertility choices.

The impact of changing labor market conditions on fertility has been investigated extensively especially in light of the burst of the Great Recession (among others: Ahn and Mira 2001; Amialchuk 2011, 2013; Bernardi and Nazio 2005; Bernardi, Klarner, and Von der Lippe 2008; De la Rica and Iza 2005; Del Bono, Weber, and Winter-Ebmer 2008; Farber 2011; Kreyenfeld 2009, Kreyenfeld et al 2012; Lindo 2010; Lutz 2014; Macunovich 1996; Mills and Blossfeld 2005; Pailhé and Solaz 2012; Ridnfuss et al. 1988; Santarelli 2011; Vignoli, Drefahl, and De Santis 2012). However, micro-level studies and, in particular, those addressing the difference between the labor market position of men and women, and research on the effect of aggregate macroeconomic conditions on micro-level data, have not yet reached conclusive results.

Looking at research conducted on European countries, the evidence is mixed. Kravdal (2002) found some negative effect of aggregate unemployment on fertility but a negligible effect of individual level unemployment in Norway. Neels et al. (2013) find a strong negative effect of unemployment rates on the hazard of first births to men and women up to age 30, and the effect is stronger for the highly educated. The negative effect of unemployment rates on childbearing after 30 is instead concentrated only on men. Schmitt (2012) found that male unemployment reduces first birth rates but the magnitude of the effect differs a lot across European countries (modest effect in UK and Germany and large in France). Pailhé and Solaz (2012) investigate the role of employment uncertainty in France in shaping the tempo and quantum of fertility. Their findings confirm the delaying effect of

unemployment on first child for men but not for women, who neither anticipate nor delay childbearing due to unemployment. Moreover, completed fertility seems to be affected only by the long-term unemployment of men.
Regarding the US, Amialchuck (2013) and Lindo (2010) investigate the effects on fertility of the husband's job loss, focusing on the income shock that the job displacement generates for the household. Amialchuck (2013) uses the American Panel Study of Income Dynamics (PSID) data in the period 1968–1992 and examines the risk for first and higher-parity births, one-to-six years after job displacement. The author finds a negative effect of the husband's job loss and layoffs on the first and the third births. Lindo (2010) using the same data finds an increase in fertility immediately after the husband's job loss, but a decline in the three-to-eight years after the job loss. After the eighth year the effect is still slightly negative, although not statistically significant.

Most studies on female unemployment point to a general negative effect of unemployment uncertainty on fertility (even though few studies manage to distinguish between unemployment and inactivity) but other studies produce weak (Ozcan 2010) or positive (Schmitt 2012) results on the relationship between women's unemployment and first births in Europe.
Meron and Widmer (2002) find in France that women's continuous periods of unemployment postpone first birth the most, followed by women who experienced intermittent periods of employment compared to women with continuous experiences of employment. They find also that inactive women are less likely compared to working-women to postpone childbearing.
Matysiak (2009) reports that women (both childless and mothers) in Poland postpone childbearing until they have found a job, net of their propensity for job market work *versus* family.
In the US, Rindfuss et al. (1988) and Macunovich (1996) also found a pro-cyclical relationship between women employment and fertility. The authors, investigating the effect of female unemployment on birth rates, point to the disruptive effect of lower expectations on future income to explain the negative impact of women's unemployment on fertility.
Bulchholtz et al. (2009)[99] found opposite results for women according to their educational level (mainly in Central and southern European countries compared to other European countries): less-qualified women react to labor market insecurity by focusing on their role of wives and mothers (as a way to reduce uncertainty) while highly qualified women react to employment insecurity by reducing childbearing. Edin and Kefalas (2005) found the same mechanism in studying single mothers in the US: disadvantaged women use motherhood as a strategy to enhance their social status, that is, to compensate for lack of personal success, i.e. low educational or work achievement, but also for the absence or misbehavior of men, and abiding feelings of despair[100].

[99] The paper summarizes the results of the Globalife (Life Courses in the Globalization Process) project on the impact of globalization on individual life courses.
[100] This reminds of Elster's concept of 'self-binding' (Elster 1979). When complexity is very high, increasing uncertainty makes long-term life paths unpredictable; individuals may want to constrain their future actions. Moreover, according to Elster, self-binding is also an effective technique to make one's promises more credible, in front of other actors, like the partner or the employer, so that they interact and cooperate more effectively than

Beyond the fact of being employed or not, job quality and job stability are further crucial conditions for parenthood (Kreyenfeld 2009). Temporary contracts have been often blamed to depress fertility (De la Rica and Iza 2005; Polavieja 2005; Worts et al. 2013) through the negative impact they have on perceived household income insecurity and also in general on life satisfaction (Scherer 2009). Results, however, differ across countries and also depending on who is suffering from job insecurity, men or women.[101]

Pailhé and Solaz (2012) find that women delay motherhood if they hold insecure job positions in France, but non-permanent employment has no effect for men.

Bernardi and Nazio (2005) investigated the effect of employment insecurity on first child in Italy and found that being in search of first job, or having a fixed-term contract reduces the probability of fatherhood; they did not find, however, any effect for women. However, being employed in the public sector - a highly secure job position - has a positive effect on the likelihood of motherhood.

Results from the European Household Panel in Spain (De la Rica and Iza 2005) indicate that for men the decision to get married is strongly negatively associated with both unemployment and unstable contracts. For women, rather, it seems that holding a precarious job contract does not affect negatively entry into marriage, although for childless women it is associated with delayed entry into motherhood.

A recent special collection of Demographic Research specifically engages with the issue of economic and employment uncertainty and fertility and family dynamics in Europe (Kreyenfeld et al 2012). Results of the studies confirm the negative effect of economic and employment uncertainty on family dynamics and parenthood decisions, even though some systematic variations are found across European countries.

A final important issue highlighted by both theoretical and empirical studies is that couple-level research is worthwhile. As said, however, the impact of the partner's characteristics is rarely investigated, mostly because it is complicated to find data that report detailed information on both members of the couple. For instance, the meta-analysis of micro-level studies on female labor-force participation and fertility done by Matysiak and Vignoli (2008) shows that the negative effect of women’s employment on fertility might be overestimated if information regarding the partner and his occupation are not included together with indicators of women’s job characteristics.

In a recent study, Vignoli et al. (2012) investigate the likelihood of becoming a parent in Italy, given the stability or instability of both couple members' job positions (similarly to what I do here). The authors point to the increasing competition in the labor markets and to the demand for workers’ flexibility as factors discouraging childbearing (see also Mills and Blossfeld 2005), and in particular regarding the transition to first birth (see also Kreyenfeld 2009). The authors find that the importance

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without such self-binding commitments (Elster 1989, 1983, 1979).

101 As evidence on job insecurity (Rosenblatt, Z., I. Talmud and A. Ruvio 1999) demonstrates, contrary to what gender theories of female disadvantaged position in the labor market would have predicted, in general male workers are more job-insecure than female ones. Specifically, men are mainly worried about the financial aspects (e.g., maintaining pay level, cutting of work hours, etc.) of job deterioration, while women emphasize both financial and autonomy (e.g., changes in work schedule or in the autonomy in work design) aspects of the job.

of dual-earner couples for childbearing is growing over time, and that compared to them other couples' job combinations reduce fertility.

As Kreyenfeld pointed out in the introduction to the special issue of Demographic Research on uncertainty and family dynamics "economic uncertainty may be understood as an individual risk factor, related to phases in the life course that are characterized by unemployment, part-time work, working on a term-limited contract, or difficulties entering the labor market in the first place" (Kreyenfeld 2012: 838). But "[…] it may also be conceptualized as an aggregate phenomenon, reflecting general uncertainties during, for example, an economic recession" (Kreyenfeld 2012: 838).

Empirical research on the interaction of different levels of economic insecurity, macro and micro, is frequent, but again, the findings regarding the consequences for individual and family dynamics are mixed.

Recently, Oesch and Lipps (2012) studied the effect of aggregate and individual unemployment on wellbeing in Germany and Switzerland testing, first, the social norm argument just described, that is, that the higher the level of aggregate unemployment around the individual, the less painful is the stigma associated with unemployment. Second, they further tested a habituation effect to recurrent episodes of unemployment, against the labor-market prospects argument that high unemployment rates signal more difficulties in finding another job, thus increasing the stress experiences around individual loss of employment. They found that people do not adapt to unemployment, and that higher regional unemployment leads to a significant decline in life satisfaction. Moreover, interacting macro and micro levels of employment uncertainty, they found no social-norm attenuation affect: the interaction is negative for German women, meaning that higher environmental unemployment increases the negative effects of being unemployed, while it is positive but not significant for men in Germany and for both men and women in Switzerland.

Lange, Wolbers, Gesthuizen and Ultee (2014) studied specifically the interaction of macro and micro economic uncertainty on family formation in the Netherlands, testing instead the previously described affordability clause (Rindfuss and VandenHeuvel 1990), that is, the normative and material principle of being economically able to support a family (Oppenheimer 1988; Kreyenfeld et al 2012). They found that individuals postpone the first union and marriage, but not the first child, due to high unemployment rates. Individual-level job conditions, i.e. temporary employment or unemployment, also do not seem to "prevent people from making long-term family commitments" (Lange et al 2014: 161). Finally, the authors didn't find that macro- and micro-level insecurities reinforce each other or that they vary between individuals with different educational qualifications.

In summary, the empirical evidence points to a generally negative effect of employment uncertainty on fertility. The most solid results indicate that the largest and more robust negative effect on birth concerns men's unemployment, and in particular the transition to first births (see for the US Amialchuck 2013 and Lindo 2010). Women's unemployment has also been found to be negatively associated with fertility in some studies (Rindfuss et al. 1988); Macunovich 1996), but more recent and qualitative studies (Edin and Kefalas 2005) found instead that women in very low socioeconomic strata might compensate for the instability in their economic and working environment by reverting to the role of mother.

In the present and the following chapters I try to advance this debate on how economic and employment insecurity affect the transition to parenthood in the US. Specifically, I will focus on the employment instability generated by the Great Recession, trying to address if and how the individual (for both men and women) and the aggregate labor market conditions interact in their impact on first births.

Having data that allows me to do so, the couple-perspective is another distinctive feature of the present chapter. Hence, both head and wife enter with their respective characteristics into the model.

3. The Statistical model

3.1. Dependent and independent variables

The model tests the hypothesis that both aggregate shocks to the labor market and individual job conditions have an impact on the transition to first birth.

As mentioned, the main focus is thus on the labor market and the way it has changed during the financial and economic crisis, on the one hand directly for the individuals and their position in the job market, but on the other hand also at the state aggregate level. A third determinant of the model is the couple perspective. As is clear from recent research, we can no longer assume a male-breadwinner model where the dynamics of the household depend only on the economic and employment conditions of the male partner. Therefore the unit of analysis will be the couple and in particular the change in their working status combination across the years of the crisis. The process under investigation is the transition to the first child, or more precisely, the probability of couples with different combinations of employment status entering into parenthood. Equation (1) below illustrates formally the model of first -child probability[102].

$$Pr\left(Y_{c,\{t-1,t\}} = 1\right) = \beta X_{c,t-2} + \gamma Z_{s,t-2} + \delta X_{c,t-2} * Z_{s,t-2} + \varepsilon_{it} \tag{1}$$

$$\varepsilon_{it} = \upsilon_i + \mu_{i,t}$$

The dependent variable is dichotomous and takes value 1 if the couple has a first child within the last 12 months before the interview (between *t* and *t-1*). In this way the independent variables, lagged by one wave, result measured around one year before childbirth (514 couples had their first child in the observed sample)[103].

There are two sets of explanatory variables in model (1): the X_C covariate measured at the couple level and the Z_S covariate measured at the aggregate level. The micro-level main explanatory variable is categorical and represents the couples' combination of employment status (from 0 to 8): 0 for dual earners couples; 1-2 if the husband is employed and wife (or cohabiting woman) is either unemployed or out of the labor force (mainly housewives but also retired, disabled or students), 3-4 if the head of

[102] I here acknowledge that the most efficient method to study the transition to the first child is Event History Analysis (EHA). For sake of simplicity I do not do EHA in the present chapter, but I apply EHA in the following Chapter IV.

[103] Once couples have their first child in *t+1* they are excluded from the sample in *t+2* as they are not units of interest anymore.

household is out of the labor force and the woman is either employed or unemployed; 5-6 if the husband is unemployed and the wife is either out of the labor force or employed, and finally the variable equals 7 when both members of the couple are out of the labor force and 8 if they are both unemployed[104]. The rationale of having this variable is to grasp whether there is a different impact of the husband's and the wife's labor-market position on the transition to parenthood, and test whether the conditions of being unemployed and out of the labor force differ in some way in their impact on first birth and across gender within the couple. Following the theoretical framework illustrated in Section 2.1, I assume that a positive impact on first births' probability of dual earners (the reference category in the analyses) over any other kind of more economically insecure couples' working combinations, signals the presence of an income effect of employment status on the propensity to parenthood. Finding instead a positive effect on first child of moving from a dual earners to a couple where only the head (or the wife) is employed would indicate that an opportunity-cost mechanism is at play; this is all the more so if the effect is positive in cases of being out of the labor force and maybe also more in cases where the wife becomes non-working. Given the already-reduced sample size it is not possible here to directly test the adverse and uncertainty reduction mechanisms that are more complicated to identify without further dividing the sample (i.e. across educational levels, age categories, or experience in the labor market).

Income or earnings, though theoretically central, are not included in the present analysis because they would absorb the income effect of unemployment, and, moreover, earnings are known to be endogenous to childbearing because of the simultaneity of the decisions and selection effect (Amialchuk 2013, Walker 2002). Education is used here as a proxy of permanent income of an individual, even though education also might be endogenous if women withdraw from education to give birth. However, this seems not to be the case given the very little variation of the education variable across time within the individual. Head's (and Wife's) education was originally coded as a categorical variable: 1 for 0-5 grades, 2 for 6-8 grades, 3 for 9-11 grades, 4 for completed high school, 5 for some non-academic training, 6 for some college and 8 for college plus some graduate studies. Since the lower educational categories are constant over time, given the age interval in which individuals were selected in the sample (16 years of age for women and 18 for men), to increase the within variation of the variable (FE models require independent variables to change across time for a substantial portion of the individuals) both heads' and wives' education were then re-categorized as dummies for Higher Education equal 1 if having some college, or college plus some graduate studies.

[104] In an earlier specification this variable of couple-working status the combination was coded more simply, pooling the categories of unemployed and being out of the labor market resulting divided in: dual earners; head working wife not working; head not working wife working and both members out of the labor market. Despite the greater simplicity of this latter specification the conditions of being unemployed and being out of the labor force have such different implications for the argument of this investigation that, when possible, I think the distinction has to be made.

[105] In this way I expect the variable to vary more over time and not to be cancelled out in the FE model.[106]

Besides education, the other controls are race[107], woman's age (linear and mean centered) and marital status, a categorical variable equal 1 if the head of the household is married, 2 if he has never been married and 3 if he is divorced, annulled or separated[108].

The aggregate-level explanatory variable, capturing macroeconomic labor insecurity, is the state-level yearly unemployment rate (average of monthly rates from the Bureau of Labor Statistics, mean-centered). To test whether unemployment has a non-linear effect on first child, unemployment quartiles (1 below 4.82%; 2 in 4.82-5.78%; 3 in 5.78-7.5%; and 4 for state unemployment above 7.5%) are also included as alternative model specification. Here I test whether there is a higher-level economic insecurity that goes beyond the individual conditions (Kreyenfeld 2012) affecting childbearing.

Finally, I am also interested in the cross-level interaction of the two explanatory variables: individual and aggregate job market conditions, to investigate whether the effect of employment insecurity on first births differs depending on the macroeconomic environment. The question I try to answer here is whether states' rising unemployment rates have an attenuating or a multiplicative negative effect on individual (couple)-level labor insecurity.

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[105] The variable is lagged to the year before birth so as to avoid reverse causation.

[106] Given the small sample size I avoided including other controls, even though the richness of the survey would have allowed me to use House Ownership and House Typology, number of siblings of both members in the couple, and others.

[107] Originally coded in detail (White, Black, Native American, Asian, Latino and Other), in the descriptive analysis, for sample size reasons, has been re-categorized as only White, Black and others in the multivariate regression analysis.

[108] Marriage most probably mediates the effect of the crisis on fertility since the latter is likely to have a depressing effect on marriage, which is still a strong channel of transition to childbearing, even though aggregate trends only suggest moderate changes in marriage and cohabitation (Cherlin 2013) that are more likely attributable to long-term trends rather than to the Great Recession. Marriage rates have been declining since the 1980s and, at the same pace, they continued to decline during the crisis, in 2007-2010 (US National Center for Health Statistics, CDC NCHS, 2012 and Cherlin 2013).
The issue of mediation of marital status is treated more in depth in Chapter IV where both single and partnered women are included in the analysis.

3.2. Model estimation

When studying employment and fertility it must be taken into consideration that a process of selection is occurring[109]; in other words, that there are unobserved characteristics of men and women that both influence the entrance/exit from the labor market and the probability of having children. One way to overcome this problem is to use panel data and control for those individual unobserved traits. As illustrated in model (1) the error term can be then considered as composed by the unobserved heterogeneity of the individual υ_i plus a true pure random component $\mu_{i,t}$. The panel structure with Fixed Effects (FE) helps to deal with the selection because it controls for all time-constant characteristics. This is as though individuals were used as controls for themselves, because it only uses the within- individual variation to estimate the effects of the covariates on the dependent variable.

Fixed-effect models are usually preferred because they suffer less from omitted variables bias, compared to random or between-effects models. However as Allison (2005) put it: whenever the within individual variation of explanatory variables is low, FE estimates are very imprecise and standard errors might become "too large to tolerate" (Allison 2005). Also, even though FE models are indeed a powerful instrument to control selection, in the case of dichotomous outcomes they are even more problematic.

The Logistic model is a non-linear model used by sociologists and demographers to study fertility, to which the panel FE structure is applied. However, in most cases, the estimator is inconsistent owing to the incidental parameters problem[110] caused by having T (fixed) observations per individual *i*, thus an increasing sample, but a fixed number of parameters to estimate (the individual fixed effects). In linear FE, with least squares estimation, we can in any case estimate individual effects u_i (the randomness in the parameters is averaged out), or difference out individual effects, and coefficients are still consistent[111] in both cases. In non-linear FE models, with maximum likelihood estimation, coefficients are inconsistent because the randomness in the estimation of the u_i cannot be averaged out as is possible in linear models. Moreover, in non-linear FE models we cannot simply get rid of the individual effects by differencing them out with within estimation (exactly because of the non-linearity of the model).

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[109] There is also an issue of reverse causation, namely that when pregnant, women leave work. And there is quite a lot of evidence that this is the case in the US (Chang and Wu 2009, unpublished; US Census Bureau 2011; Livingstone 2014, Pew Research Center Report). However, this problem can be largely overcome by lagging the independent variables on labor market condition by one year, or more, before the birth of the child.

[110] "The justification for maximum likelihood estimators is usually asymptotic, which means that it's based on how the estimators behave as the sample gets large. However, the validity of that justification depends on the presumption that the number of parameters remains constant, as the sample gets larger. For longitudinal data, that works just fine if the number of individuals remains constant but the number of observations per individual gets larger. But if the number of individuals gets larger while the number of time points remains constant, then the number of parameters in a fixed effects model (including coefficients of the dummy variables) increases at the same rate as the sample size. This is not a problem with linear models and (somewhat surprisingly) for the Poisson models. But it is a serious problem with logistic regression and many other nonlinear regression models. The biases are greatest when the number of time points per individual is small. The solution to this problem is to do conditional maximum likelihood (Chamberlain 1980) […]" Allison, Paul David (2005). *Fixed effects regression methods for longitudinal data: Using SAS*. Vol. SAS Institute.

[111] A consistent estimator is an asymptotically unbiased estimator, meaning that as n grows to infinity the distribution of the estimator converges in probability to the true parameter object of estimation.

This is why the Conditional Maximum Likelihood (CML) estimation is used, which transforms the ML function as dependent on the β and not on the u_i: the CML estimator is consistent, even though very model-specific, and it works only with the Logistic form[112]. In practice, the Conditional logit estimates the ordinary logit within groups - it models the probability of the outcome being 1 in group 1, conditional on observing that outcome in that group - where each group is the individual over time.

Moreover, the CML method works only with the subsample of individuals who present a change in the dependent variable (we lose many observations compared to the linear FE) since groups that contain all-positive or all-negative outcomes do not provide information because the conditional probability of observing such groups is 1 regardless of the parameters. In a logistic regression with FE, in fact, if the dependent variable is always 0 or always 1 then (the maximum likelihood estimator of) the coefficient of that individual's fixed effect is infinite in magnitude. The fixed effect for that individual becomes a perfect predictor[113] of the outcome. In a simple linear regression, perfect prediction does not 'blow up' estimates; the fixed effect for that individual is simply equal to 0, which does not prevent estimation, and this is the reason why observations are not dropped from the linear analysis as they are in the logistic. For example in the present case the sample size drops substantially, from around 1400 individuals (roughly 3000 observations) to 400 (around 1400 observations).

Changes in the covariates are thus used to explain changes in the observed sequence of outcomes y_{i1} … y_{iT}. Differencing the covariates removes all the variables that are constant over time (i.e. gender, birth year, etc.) so that the intercept cannot be estimated. In the same fashion the Conditional Logit also removes the individual effects u_i, such that no assumptions about it have to be made, but as a consequence it cannot be estimated. The fact that the intercept remains unestimated explains why predicted probabilities and marginal effects cannot be obtained – or it makes little sense to get them: the predicted probabilities we get[114] are the conditional probabilities of a positive outcome, given a single positive outcome within the group, which is different from the overall probability of a positive outcome you get after a simple logit. The only way to get predicted probabilities and marginal effects is to calculate them assuming that the individual fixed effect is zero, an extremely unrealistic assumption, forcing the group specific deviations to be zero (i.e. you obtain the probabilities for the average group). If you do not set these group deviations to zero they are left unspecified, because the model does not estimate them. Hence they will not appear in the variance covariance matrix and the delta method will not estimate it[115].

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112 Fixed Effects non-linear Model is only allowed with the logistic functional form.
113 Perfect prediction is also defined as complete separation.
114 With the usual command PREDICT after a CLOGIT.
115 "The fixed effects logit estimator of β immediately gives us the effect of each element of x_i on the log-odds ratio… Unfortunately, we cannot estimate the partial effects… unless we plug in a value for α_i. Because the distribution of α_i is unrestricted – in particular, $E[\alpha_i]$ is not necessarily zero – it is hard to know what to plug in for α_i. In addition, we cannot estimate average partial effects, as doing so would require finding $E[\Lambda(x_{it}\beta + \alpha_i)]$, a task that apparently requires specifying a distribution for α_i."Wooldridge, J. (2002). *Econometric Analysis of Cross Section and Panel Data*. Vol. MIT Press.

These are some of the reasons for preferring the Fixed Effects Linear Probability Model (LPM) even if the dependent variable is binary (0,1). LPM is simple to implement, its coefficients have a very straightforward interpretation compared to non-linear models, its sample size is reasonable and the model is relatively stable. Finally, the marginal effects in the logit model equal the estimates in the LPM in the cross-sectional setting. However, the LPM itself suffers from some often cited-problems when applied: first, the predicted probabilities of the outcome may fall outside the admissible [0,1] interval, second, the variance of the error terms is not constant but depends on the independent variables, i.e. errors are Heteroskedastic (though the robust standard errors option would solve the problem) but most importantly, the effect of the covariate X_j on the dependent variable is constant at β_j, independent of the value of X_j and other covariates, which is usually not the case in non-linear models. When analyzing binary responses we are, in fact, modeling the underlying probability of Outcome=1 and non-linear methods would be most appropriate for this, even though it is more difficult to estimate coefficients because in a non-linear setting the coefficients are not directly tied to the marginal effects. However, when coming to comparing the LPM to the Conditional Logit the drawbacks and complexity of the latter seems to be large and this is the reason why in the literature, despite the attractiveness of non-linear models, LPM is still widely used and there are plenty of empirical rationales for it. For instance, McGarry (2000) appeals to the ease of interpretation of estimated marginal effects, while Fairlie and Sundstrom (1999) prefer LPM because it implies a simple expression for the change in unemployment rate between two censuses. Currie and Gruber (1996) state that logit, probit, and OLS are similar and only report LPM results.

In the case of panel data, moreover, the great complexity – described above – is usually a reason for preferring LPM to the Conditional Logit (see Klaassen and Magnus 2001; Horrace and Oaxaca 2006).

A final remark must be made regarding the structure of the research questions of this chapter[116]. In fact, despite the structure of the data and the hypotheses outlined in this and the previous sections being hierarchical in nature, I did not mention until now the possibility of using a Multilevel model. The hypothesis of a cross-level interaction between aggregate (i.e. state-level), and couple-level explanatory variables would suggest a statistical model with a hierarchical structure too. However, cross-level interactions can be tested in both panel fixed-effect models and multilevel (random effects) models and there are two reasons justifying my preference for a panel FE model: first, the model is quite complex and the sample size (see the next section) is small, and second, I am not specifically interested in estimating the second-level independent-variables (i.e. US states) effect on first births but only on the effect of macroeconomic conditions and their moderating/multiplicative effect on first level (i.e. employment status) explanatory variables, net of other state specificities. All

[116] The same argument applies also to the next chapter.

in all, a multilevel model would have increased complexity without yielding significant gains in terms of estimation.[117]

In conclusion, the model I will test in the multivariate regression analyses in Section 6 is the Fixed Effects LPM model of the probability of first birth. Standard errors are panel-corrected robust SE to account for the autocorrelation of the panel data structure.

As a benchmark to evaluate the FE model estimates, and to identify if there is a selection effect into the estimates, I illustrate, first, the naïve cross-sectional estimates pooling observations together (and also separate by periods) and, second, the estimates of a Between Model (BE) to compare the estimates coming from the variation between individuals to the variation within individuals of the FE models. The BE model, in fact, controls for omitted variables that change over time but that are constant between cases (contrary to the FE model that controls for omitted units characteristics constant over time). In practice it averages variables over time within each individual. Comparing the BE and FE models is useful to grasp the complete picture, also regarding the argument above on the hierarchical structure of the hypothesis involving cross-level interaction.

[117] To control for geographical differences and since within migration in the US is quite frequent, following Oesch and Lipps (2012), I add to the fixed effect model a dummy variable for state of residence in the US. See the results in Section 6 and footnotes 138-140, for a detailed illustration of the robustness checks conducted in this respect.

4. The PSID Data

I used the Panel Survey of Income Dynamics (PSID) as a dataset. This is a biennial longitudinal survey that started in 1968. The PSID originates from the antecedent Survey of Economic Opportunity (SEO)[118], whose original aim was to study the dynamics of income and poverty, from which 1872 low-income families were selected and to which a nationally representative group of 2930 families[119] was added. In total 18000 individuals were living in these families selected in 1968, constituting the core of the sample. Before 1997 the survey was annual, while it became biennial thereafter. The way subsequent waves are constructed is the following: any individual born to, adopted by, or married to a member of the original sample becomes part of the PSID study and, as members (children) move out of parental house and establish their independent units, they are interviewed as new families.[120] Following children as they become adults is a unique survey design that helps maintaining the national representativeness of the survey, together with facilitating intergenerational studies (McGonagle et al., 2012).

A single primary adult is the main respondent to the questionnaire and he (or she in the case of a single woman) is defined as the Head of the family. The Wife is defined so if she is married to the Head, otherwise she is defined as Cohabiting Wife. Demographic, educational and labor market information is available for every member of the family, classified in terms of his/her relationship to the Head of the family. To maximize consistency over time in the PSID survey the same family member is interviewed in each wave[121]. Response rates are equal or higher than comparable panel surveys worldwide (McGonagle et al. 2012: 270)[122][123]. Despite the modest wave-to-wave attrition, the representativeness of PSID of the US population is supported by the close alignment of weighted estimates with those from other surveys like the March Current Population Survey for income, the Survey of Consumer Finances for wealth or the American Time Use Survey. PSID has also low item non-response, with only a few items with missing responses for more than 3-4% of the individuals

[118] Conducted by the Office of Economic Opportunity directed by the U.S. Bureau of the Census.

[119] The sample was designed by the Survey Research Center (SRC) at the University of Michigan.

[120] In 1990, 2043 Latino households were added but because the group did not include all post-1968 immigrants, and because of funding reasons, the Latino immigrant group was dropped in 1995. In 1997 some families were dropped because of the rapid increase in the size of the PSID sample and the financial costs implied by this escalation in size, while 511 immigrant families were added to maintain the representativeness of the sample.

[121] Approximately 95% of families have the same respondent in successive waves.

[122] "Response rates are calculated for each of the "sample types" within PSID. The sample is defined across two different strata: first, whether it is considered "core" versus "immigrant refresher", and second, whether in the previous wave, the sample type is "re-interview" versus "split-off" versus "re-contact." In regards to the first strata, the "core" sample consists of all families except those added in the 1997 immigrant refresher sample. In regards to the second strata, the "re-interview sample" includes families who were successfully interviewed in the previous wave. "Split-off" families consist of individuals who left a PSID family unit and established their own economically independent unit. Finally, the "re-contact" sample consists of families who did not respond in the previous wave, but were respondents in the wave before the previous wave. PSID attempts to re-contact and interview these families in subsequent waves, as a way to minimize attrition and maintain the representativeness of the sample" (McGonagle et al, 2012: 270).

[123] "Despite consistently high response rates, there is evidence that lower-income families have higher cumulative attrition (e.g. Fitzgerald et al 1998; Fitzgerald 2011). However, parameter estimates of interest have not been found to be biased. In a recent analysis of the effects of cumulative attrition in PSID up to 2007, Fitzgerald (2011) finds little or no evidence of biased estimates of sibling correlations, or of parameters, in inter-generational models of health outcomes." (McGonagle et al, 2012: 272).

(Killewald et al 2011)[124]. Finally, the PSID data are publicly available[125] with nearly 70000 variables from over 70000 individuals, and covering over 44 years (McGonagle et al. 2012: 272)[126].

For the construction of the sample, I started with the panel from 2003 to 2011 (last 5 waves) with 4631 Heads. I dropped widowed and individuals without a wife or a cohabiting woman in the family unit since I do not have any information on the non-cohabiting partner characteristics[127]. From them I also excluded those residing outside the US, to whom I could not attach any macroeconomic variable. The remaining sample is composed of 2211 couples (5375 observations[128]), 59.2% of which are married at the time when they entered the survey[129], 33.9% have never been married (are cohabiting) and 6.8% are either divorced or separated (0.1% have missing information on marital status). The age range in sample is 18-45 for men while female partners' age ranges between 16 and 49[130].

124 "Although families comprised entirely of post-1997 immigrants are not part of the sampling frame, this group is a small segment of the U.S. population and over time joins the PSID sample through intermarriage. Nonetheless, the addition of a post-1997 immigrant refresher sample remains a high priority for the project's strategic plan" (McGonagle et al, 2012: 272).

125 http://psidonline.isr.umich.edu

126 The PSID sample design is similar in its basic structure to the multi-stage designs used for major survey programs. The survey literature refers to these samples as *complex designs*, since the sample incorporates special design features such as stratification, clustering and differential selection probabilities (i.e., weighting). Longitudinal individual weights, longitudinal family weights, and cross-sectional individual weights are provided to account for differential probabilities of selection. A standard statistical analysis typically assumes instead *simple random sampling* (SRS) or independence of observations in computing standard errors for sample estimates. In general, the SRS assumption results in underestimation of variances of survey estimates of descriptive statistics and model parameters. Confidence intervals based on computed variances that assume independence of observations will be biased. Likewise, test statistics computed in complex survey data analysis using standard programs will tend to be biased upward and overstate the significance of tests of effects. (Heeringa et al. 2011: 3)
However, the survey literature also has highlighted reasons for not using weights in the analysis: first of all, weights primarily adjust means and proportions and therefore are useful mostly for descriptive purposes, while doing inference their results are more problematic. Second, weights - increasing the standard errors of estimates - introduce quite a lot of instability into the data. There is thus a trade-off between instability and representativeness of the estimates.
Instead of directly using weights, an alternative would be to include in the model, as additional independent variables, all the variables used to generate the weights. In this way results yield unbiased estimates and standard errors. Another option is to include directly in the model, as a regressor, the weights: if they are found to be significant, it means there is endogenous weighting and you have to weight observations. Here, since weights result substantially and statistically insignificant, and the model is already quite complex and fragile (see following paragraphs), I preferred not to use them.
Detailed information about weights is available at http://psidonline.isr.umich.edu/Guide/documents.aspx.

127 Technically I do not even know if there is a non-cohabiting partner.

128 For the regression analysis I dropped the observations after the first child is born; therefore the final N in the regression models is 4716. Moreover, considering the missing values in the explanatory variables and the controls, and the necessity to lag those independent variables to the previous wave, in the regression the sample size shrinks even further to around 2500 observations.

129 The time of entry (wave) can be different for different couples.

130 To restrict the sample to potential mothers.

Table 3.1: Descriptive statistics on couples' demographic composition.

	Number of couples	Percentage
Marital Status		
Married	1309	59.2%
Never Married	749	33.9%
Separated or Divorced	151	6.8%
Missing	2	0.1%
Among racially homogamous		
Married	3532	75.3%
Never Married	959	20.4%
Separated or Divorced	200	4.3%
Among racially Heterogamous		
Married	444	65.1%
Never Married	197	28.9%
Separated or Divorced	41	6%
Ethnic Composition (Homogamous)		
Among married couples		
White	874	66.8%
Black	238	18.2%
Asian	11	0.8%
Latino	11	0.8%
Native Americans	4	0.3%
Other races	14	1.1%
Among cohabiting couples		
White	383	51.1%
Black	216	28.84%
Asian	1	0.1%
Latino	1	0.1%
Native Americans	2	0.3%
Other races	18	2.4%
Ethnic Composition (Heterogamous)		
Among married couples		
Black head – White wife	32	2.44%
White head – Black wife	12	0.9%
Other race head – White wife	69	7.3%
White head – Other race wife	61	6.5%
Among cohabiting couples		
Black head – White wife	46	6.1%
White head – Black wife	5	0.7%
Other race head – White wife	68	15%
White head – Other race wife	33	7.9%
Education°		
Heads with High Education	565	25.6%
Wives with High Education	715	32.3%
Educational Composition		
Among married couples		
Homogamous High Edu	329	25.1%
Homogamous Low Edu	783	59.8%
High Edu head – Low Edu wife	56	4.3%
Low Edu head – High Edu wife	141	10.8%
Among cohabiting couples		
Homogamous High Edu	128	17.1%
Homogamous Low Edu	510	68.1%
High Edu head – Low Edu wife	27	3.6%
Low Edu head – High Edu wife	84	11.2%

Source: Elaboration of the author based on PSID data. °High education is 'at least some college' and low education is completed high school or having some non-academic training besides high school.

Table 3.1 illustrates the descriptive composition of the couples in terms of demographic characteristics by marital status. White couples prevail in the ethnic composition of the racially homogamous married couples (67%), while among the homogamous cohabiters 50% are White couples and one-third of is African American.

Mixed couples exist but they are rare, and among them cohabitation is more diffused that among homogamous couples (almost 30% of the heterogamous cohabit versus 20% of the homogamous). White women tend to marry interracially slightly more often than White men: 7.3% of White women married a man of a different race, while the opposite happens in 6.5% of the cases. A much larger gender difference exists among cohabiters: 15% of White women cohabit in a mixed couple while only 7.9% of White men cohabite with a non-White woman.

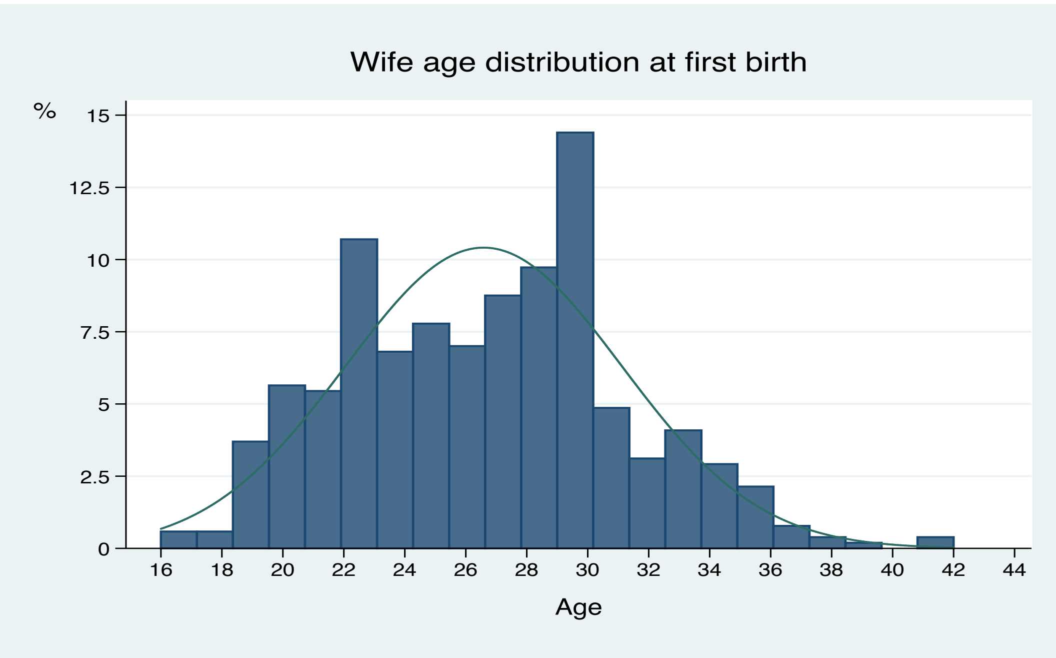
In terms of education, both among married and cohabiting couples, the large majority of couples are homogamous with low education (around 60% and 70% respectively in the two groups), while only one-fourth of married couples and 17% of the cohabiters both have high education. Women marry educationally downward more often than men, confirming the recent trend in the US identified in Section 1 (Livingstone G., 2014, Pew Research Center; Bureau of Labor Statistics; OECD). In fact, 10.8% of married women with high education (at least some college) have less-educated partners whereas for men this happens in only the 4.3% of the cases. These percentages do not change much looking at cohabiting couples, even though in the latter case the highlighted trend is slightly more accentuated (11.2% of women partnered with a less-educated man versus 3.6% of men partnered with less-educated women).

5. Descriptive Results

As illustrated in the data section (see Table 3.1), the sample of couples presents some heterogeneity in terms of racial, educational and marital status composition. Around 40% are non-White, one-third are cohabiting couples, and women are more educated than men (one-third of women have at least some college while only 25% of men do) and tend to marry educationally upward and interracially more often than their male counterparts[131]. Bearing in minds these characteristics and before showing the main results of the analysis, it is worthwhile describing the distribution in the sample of the dependent variable, first births.

Figure 3.4 depicts the percentage distribution of first births in the sample by mothers' age. In the sample we find two peaks: a first one in the early twenties, and a second one around age 29. The mean wife age at birth in the sample is 26.6 years (the median is 27), slightly above the national average of almost 26 years (2012 estimate from CDC).

Figure 3.4: Percentage distribution of first births by mothers' age.



Source: Elaboration of the author based on PSID data.

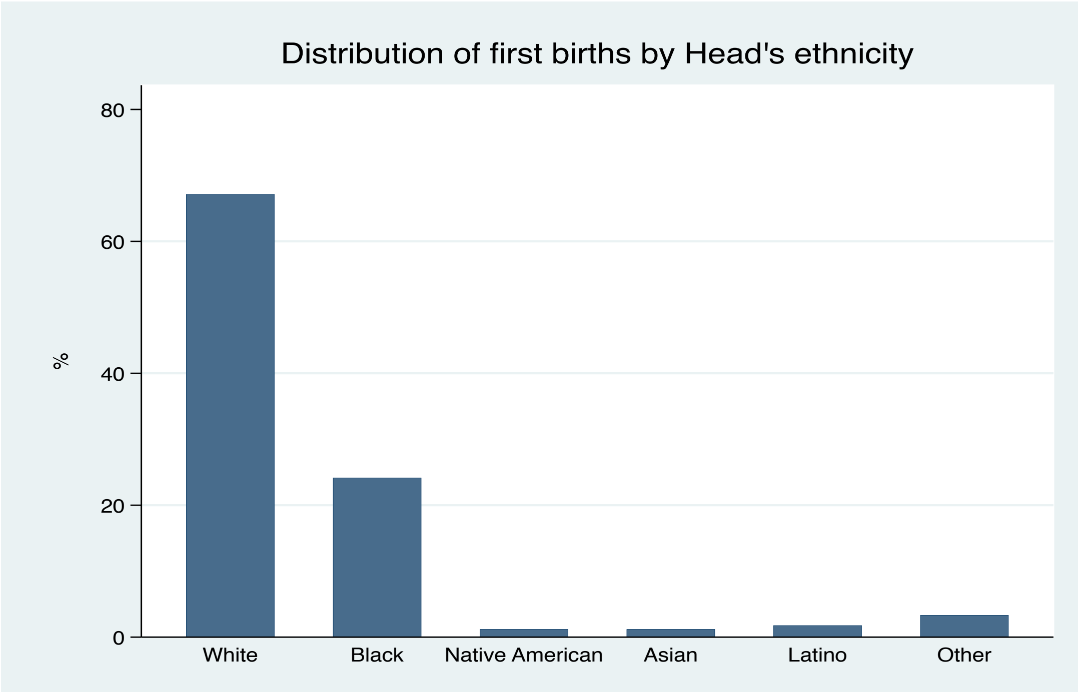
Figure 3.5 illustrates the distribution of first birth episodes by Heads' ethnicity: 68% (345) of the 514 total births in the sample, happen in couples where the head is White non-Hispanics, 24.5% (124) of births are to Black heads, around 2% (9) are to White Hispanics, and 1.2% are of Asian (6)

131 Table A2.1 in Appendix 2 reports general summary statistics for the sample used in the study.

and Native American (6) heads (17 births are from couples with head of other ethnicities and 7 births are to couples of both head and wife of unknown ethnicity).

Concerning couples' ethnic composition (not shown): 65% first births are to White-White couples, 18.5% are to Black-Black couples and 5% are to Black-head White-wife couples (the other combinations are all below 1%).

Figure 3.5: Percentage distribution of first births by head's race.



Source: Elaboration of the author based on PSID data.

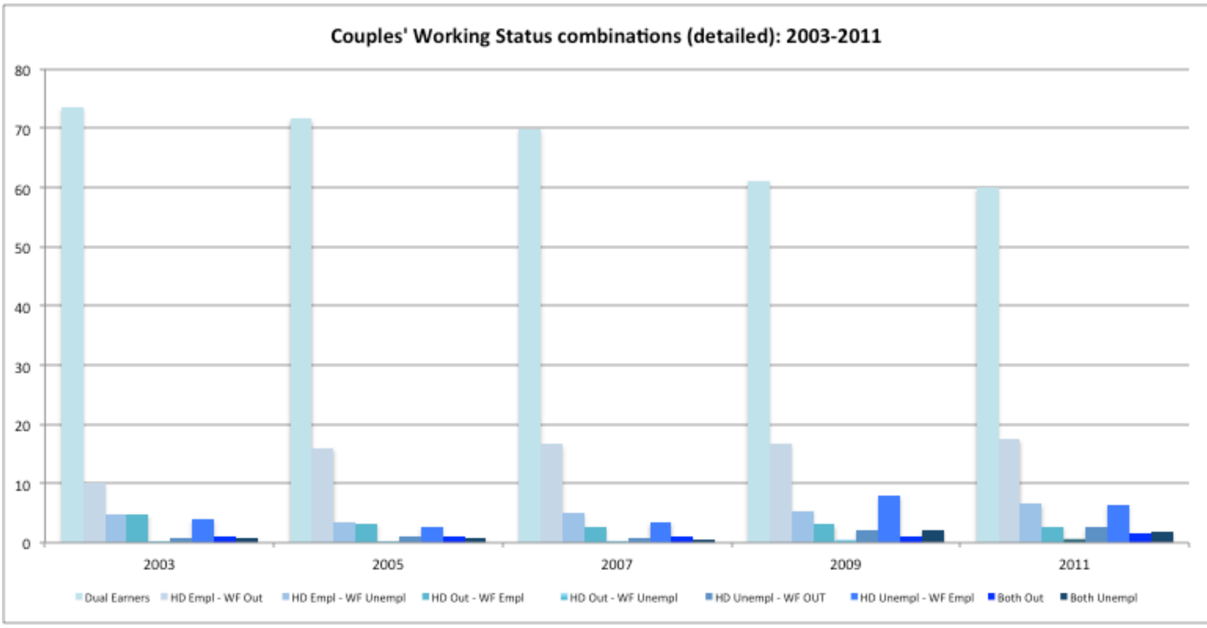
Turning to the main individual-level explanatory variable, Figure 3.6 illustrates the distribution of couples' working status combination[132], by survey wave: bars indicate the proportion of couples in each of the eight combinations of dual earners, head or wife employed, out of labor force and unemployed, or both out of the labor force or both members unemployed (see also Table A2.2 in Appendix 2). Between 2003 and 2011 the proportion of dual-earner couples declines from more than 73% to 59%, while the couples in which both members are out unemployed more than double, going from 0.8% to 1.95%. During the same period couples where only the head is working rise from 10% to 17.5% with women going out of the labor force and from 4.7% to 6.5% with wives being unemployed. Wives are the only workers with an unemployed husband in 4% of the couples in 2003 but this proportion increases to 7.9% in 2009 and it goes down to 6.4% in 2011[133]. All in all, these descriptive

132 Episodes in person-years.

133 The same figure (not shown) across educational levels indicate that this time trend is common to both types of households (high/low educated: high education means having some college or more): between 2003 and 2011 the proportion (100% is year/education combination) of dual earners declined while that of couples with both members out of the labor market increased (as did only head working). The changes over time are however more pronounced for the low-educated: the drop in dual-earners couples was around 20% (less than 10% in highly educated) and the increase in non-working couples is around 5% (2-3% for highly educated). The proportion of households where only the head is working was very similar across

estimates confirm the increasing difficulties faced by households in the labor market during the years of the crisis.

Figure 3.6: Percentage distribution of couples' working status across waves.



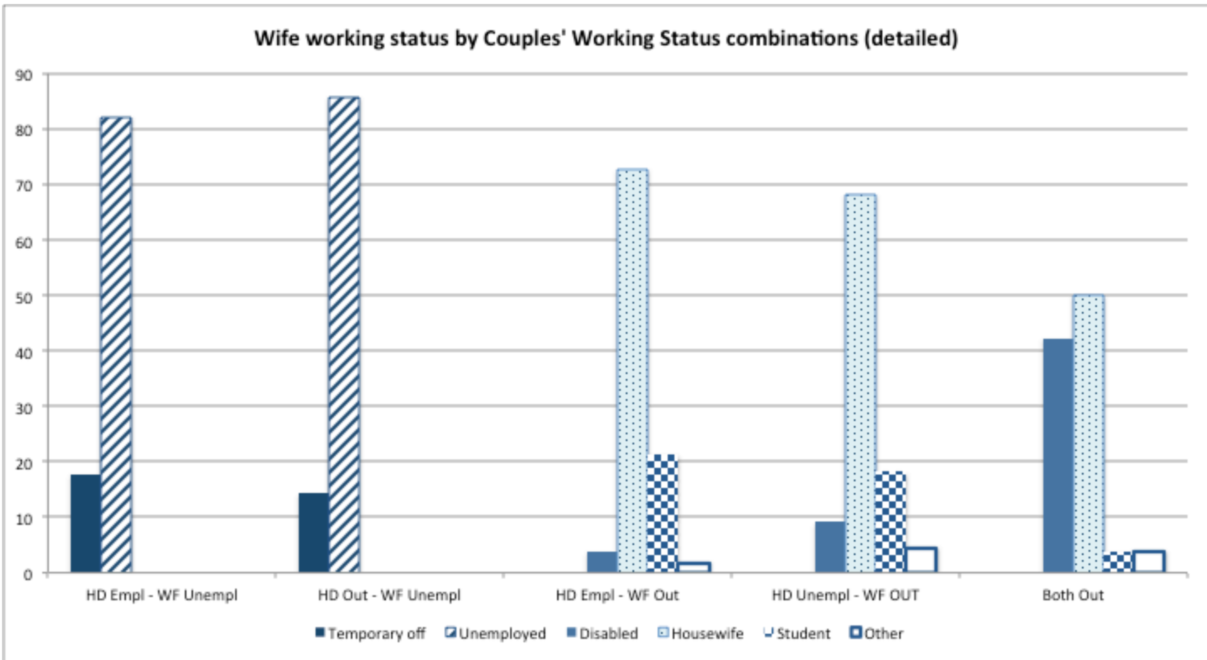
Source: Elaboration of the author based on PSID data.

To get a more detailed idea of how these couples' working combinations look like, Figure 3.7 illustrates for each couples' working status the detailed status of the wife. For instance, in only around 15-17% of the cases when wife is unemployed, she is just temporarily laid-off (depending on the husband working status). More interestingly, when we consider women who are out of the labor force, in the majority of the cases they are housewives (72% in the couples where the husband is employed; 68% when the husband is unemployed and 50% when both members are out of the labor force)[134]. Finally, in around 20% of the couples where the wife is out of the labor force, she is still a student. Since each category has a different probability of parenthood, this more detailed picture will help later on in interpreting the results of the analysis.

education levels in 2003 (around 13/15%) but the difference grew larger and by 2011 in low educated couples the share got to almost 25% (20 in highly educated).

[134] In 42% of the couples where both husband and wife are out of the labor force, the wife is disabled, meaning that these couples are probably those with the smallest probability of having a baby.

Figure 3.7: Percentage distribution of wives' working status by couple's working status combinations.



Source: Elaboration of the author based on PSID data. Cells size:333 couples are HD employed – WF out of LF; 101 couples are HD employed – WF unemployed; 83 couples are HD out of FL – WF employed; 7 couples are HD out of FL – WF unemployed; 22 couples are HD unemployed – WF out of LF; 115 couples are HD unemployed – WF employed and finally in 26 couples both HD and WF are out of LF and in 18 they are both unemployed.

Figure 3.8 (see also Table A2.3 in Appendix 2) depicts couples' working-status combination around first births episodes, instead of pooling observations by survey wave. Here I use a less refined categorization of the couples' working status combination (in four categories: dual earners, head or wife only working and both non-working) so as to not complicate the picture too much.

The first group of bars from the left includes all episodes of childlessness in the sample, for couples who do not have children during the whole period of observation (the period of observation might be different for each individual)[135]. Almost 70% of childless couples are dual earners, more than 19% have only the head in the labor market (only wife is 7.8%) and 3.4% of them have both members not working.

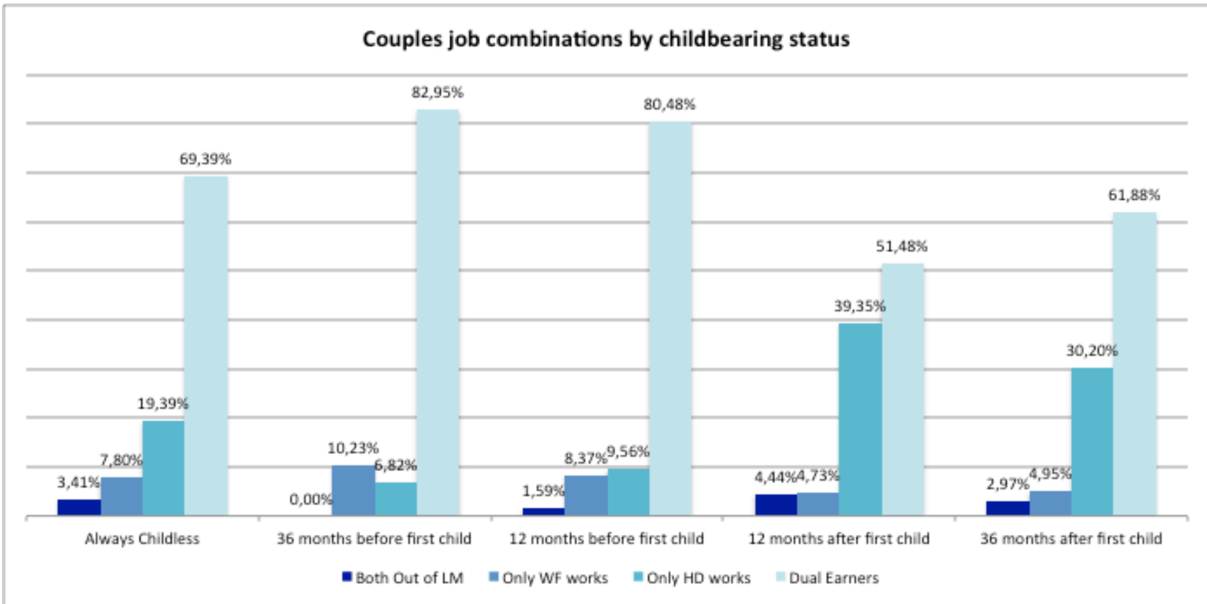
The second group of bars describes the working-status combination of couples who reported having had their first child 36 months later: 83% of those having a child in three years where in a dual-earner couple, and for 10% of them only the wife was working. The third group of bars reports the same combination around conception time: still in more than 80% of the couples both members are working, while only-husband-working couples grow to 9.6% and only-wife-working couples go down to slightly more than 8%.

Despite being just descriptive and preliminary, these graphs are useful to understand how, on average, couples' working-status combination might change around the first birth and to compare those to couples that do not have babies. For instance, compared to childless couples it seems that future parents around conception are more often both in the labor market. The closer we get to the

[135] As before, observations are episodes, namely person-years.

conception date the more women seem to leave the market and the couples where only the head works increase.

Figure 3.8: Percentage distribution of couples' working status (before/after first birth).



Source: Elaboration of the author based on PSID data.

Finally, for comparison, I also included episodes after birth, and the results are interesting: 12 to 36 months after the first child is born (last two groups on the right of Figure 3.8) the proportion of dual-earner couples goes down to 51% in favor of an almost 40% of couples where only the man is working. Wife-working couples drop to less than 5%. After the birth of the child the percentage of couples with working women seem to be less, in favor of a male-breadwinner household model where only the man works (although there is a small return of women to work after 3 years from birth).

This process has been identified in many countries (Angrist and Evans 1998; Anon 2014; Chang and Wu 2009; Gutierrez-Domenech 2005; de Laat and Sevilla-Sanz 2011; Matysiak and Vignoli 2008, 2010, 2013; Vignoli 2013; Vignoli and Salvini 2008) especially in traditional ones and in those countries that provide poor public child care and parental leave.

In the US as already mentioned in Section 1, almost one-third of mothers are out of the labor force to take care of the family, 4% of whom are highly qualified women (opt-out mothers; Belkin 2003). A survey conducted in 2009 by the Center for Work and Life Policy, on the labor market participation of mothers shows that 89% of the stay-at-home moms plan to return to work and then around 70% of these actually manage to go back to the labor market, on average around two-and-a-half years after childbearing (US Census Bureau 2011 and Livingstone 2014, Pew Research Center Report). This evidence is line with the results found in the PSID sample and shown in Figure 3.8.

6. Multivariate regression results

The analyses that follow investigate more rigorously the role of the labor market status of the couples on the probability that they have their first child. Also particular attention is devoted to the cross-level interaction between the micro-level couples' working status and the aggregate, state-wise, employment conditions, namely the state-level rate of unemployment (in both formulations: linear[136] and non-linear). The analysis starts from the naïve cross-sectional models, and the BE models, whose results will be used as a benchmark for the Fixed Effects (FE) linear probability model, as described in the previous sections.

Tables 2 and 3 show the results of the naïve cross-sectional analyses. The former reports findings by pooling all the observations in the waves 2003-2011 together, while the latter shows the results of pooling observations two-by-two waves (2003/05, 2007/09 and 2009/11). Pooling observations on pairs of survey waves largely reduces the sample size but allows me to separate the pre- and post-recession periods: a first attempt to test whether patterns differ in different periods[137].

First of all, the cross-sectional analyses show no relationship between the level of aggregate unemployment and the probability of first birth. In both specifications, linear and categorical of the state-level explanatory variable, coefficients in most cases have the expected sign (greater unemployment reduces the likelihood of first child) but the point estimates are substantially and statistically not significant. The only exception is in Table 3.3 where low unemployment (2nd quartile: 4.8%-5.8%) in 2009 is associated, compared to high unemployment (4th quartile: >7.5%) to a 10% smaller probability of couples having their first child by 2011. Recalling from Figure 3.2 that previously showed the map of unemployment rates in the US states, in 2009 low unemployment was concentrated on the north-central states – traditionally low-fertility states; while very high unemployment was registered in the Pacific and the South-East – traditionally high-fertility states. I would interpret then the estimate in Model 6 in Table 3.3 as a geographical variation effect that emerged with the crisis.

This claim is confirmed in the BE models in Table 3.4, which uses explicitly only the cross-sectional variation between units. Comparing couples living in states with different unemployment levels in general, namely averaging over the time trend in 2003-2011, it is clear that higher rates of unemployment are detrimental for the transition to the first child, even controlling for couples' employment status. The probability of first birth is around 10% higher in states with unemployment rates lower than 7.5%, compared to states where it is, on average, larger than 7.5%. Even though not

[136] Aggregate unemployment rate is mean centered.
[137] As said, the ultimate objective is to compare these naïve estimates with the fixed effect models, to attempt a more causal interpretation of the FE model.

controlling for any selection effect on the estimates, these cross-sectional findings on the impact of aggregate unemployment on fertility seem to suggest that the variation in unemployment is larger across US states than within them over the period 2003/2011, notwithstanding the onset of the Great Recession.

Table 3.2: Pooled cross-sectional models (all waves) of the probability of first birth.

	Model (1)	Model (2)	Model (3)
State Unemployment rate	-0.001		
	(-0.006 - 0.004)		
Very Low Unemployment (< 4.8%)		0.018	
		(-0.014 - 0.050)	
Low Unemployment (4.8 - 5.8%)		-0.004	
		(-0.035 - 0.027)	
Middle Unemployment (5.8% - 7.5%)		0.026	
		(-0.007 - 0.060)	
High Unemployment (> 7.5%) Ref. Cat.		-	
1 "HD Employed - WF Out of LF"			-0.068***
			(-0.095 - -0.040)
2 "HD Employed - WF Unemployed"			-0.046*
			(-0.099 - 0.007)
3 "HD Out - WF Employed"			-0.030
			(-0.097 - 0.036)
4 "HD Out - WF Unemployed"			-0.094***
			(-0.132 - -0.055)
5 "HD Unemployed - WF Out of LF"			-0.131***
			(-0.158 - -0.103)
6 "HD Unemployed - WF Employed"			0.011
			(-0.049 - 0.071)
7 "Both Out of LF"			-0.017
			(-0.117 - 0.084)
8 "Both Unemployed"			-0.041
			(-0.155 - 0.073)
Race: White (Ref. Cat.)	-	-	-
Race: African American	-0.004	-0.006	-0.003
	(-0.032 - 0.024)	(-0.034 - 0.023)	(-0.032 - 0.026)
Race: Other	0.035	0.036	0.040
	(-0.027 - 0.097)	(-0.026 - 0.098)	(-0.022 - 0.102)
Wife Age	-0.006***	-0.006***	-0.007***
	(-0.008 - -0.005)	(-0.008 - -0.005)	(-0.008 - -0.005)
Married (Ref Cat)	-	-	-
Cohabiting	-0.071***	-0.070***	-0.070***
	(-0.100 - -0.043)	(-0.098 - -0.042)	(-0.099 - -0.041)
Divorced/Separated	-0.054**	-0.053**	-0.044*
	(-0.101 - -0.007)	(-0.101 - -0.006)	(-0.093 - 0.006)
Head High Education	0.022	0.021	0.021
	(-0.010 - 0.055)	(-0.011 - 0.054)	(-0.012 - 0.054)
Wife High Education	0.016	0.017	0.011
	(-0.013 - 0.046)	(-0.013 - 0.046)	(-0.019 - 0.041)
Constant	0.107***	0.097***	0.122***
	(0.089 - 0.125)	(0.072 - 0.122)	(0.102 - 0.142)
N	2,489	2,489	2,471
R-squared	0.024	0.025	0.031

Source: Elaboration of the author based on PSID data.

Note: Robust Confidence Intervals in parenthesis. ***p<0.01, **p<0.05, *p<0.10. State unemployment rate centered at the mean. Wife Age also mean-centered. Reference categories are High unemployment rate (>7.5%), being in a dual earner couple, being White non-Hispanic and being married.

Table 3.2 cont'd: Pooled cross-sectional models (all waves) of the probability of first birth.

	Model (4)	Model (5)	Model (6)	Model (7)
State Unemployment rate	-0.000 (-0.005 - 0.005)		-0.001 (-0.007 - 0.005)	
Very Low Unemployment (< 4.8%)		0.014 (-0.017 - 0.046)		0.022 (-0.019 - 0.064)
Low Unemployment (4.8 - 5.8%)		-0.009 (-0.041 - 0.022)		-0.013 (-0.052 - 0.027)
Middle Unemployment (5.8% - 7.5%)		0.020 (-0.014 - 0.053)		0.015 (-0.027 - 0.058)
High Unemployment (> 7.5%) Ref. Cat.				
1 "HD Employed - WF Out"	-0.068*** (-0.096 - -0.040)	-0.068*** (-0.095 - -0.040)	-0.067*** (-0.095 - -0.039)	-0.088*** (-0.124 - -0.051)
2 "HD Employed - WF Unemployed"	-0.046* (-0.099 - 0.007)	-0.046* (-0.099 - 0.007)	-0.050* (-0.102 - 0.002)	-0.044 (-0.126 - 0.038)
3 "HD Out - WF Employed"	-0.030 (-0.096 - 0.036)	-0.029 (-0.096 - 0.037)	-0.033 (-0.099 - 0.033)	0.007 (-0.128 - 0.143)
4 "HD Out - WF Unemployed"	-0.094*** (-0.132 - -0.055)	-0.097*** (-0.136 - -0.058)	-0.095*** (-0.136 - -0.053)	-0.088*** (-0.121 - -0.056)
5 "HD Unemployed - WF OUT"	-0.131*** (-0.160 - -0.101)	-0.128*** (-0.157 - -0.100)	-0.137*** (-0.169 - -0.105)	-0.114*** (-0.154 - -0.073)
6 "HD Unemployed - WF Employed"	0.011 (-0.050 - 0.071)	0.011 (-0.049 - 0.071)	0.015 (-0.054 - 0.085)	0.013 (-0.073 - 0.099)
7 "Both Out"	-0.017 (-0.117 - 0.084)	-0.016 (-0.118 - 0.086)	-0.019 (-0.117 - 0.078)	0.054 (-0.163 - 0.271)
8 "Both Unemployed"	-0.041 (-0.155 - 0.074)	-0.041 (-0.156 - 0.074)	-0.081** (-0.155 - -0.006)	0.004 (-0.169 - 0.176)
1 "HD Employed - WF Out"* Unemployment rate			-0.002 (-0.012 - 0.008)	
2 "HD Employed - WF Unemployed"*			0.007 (-0.013 - 0.028)	
3 "HD Out - WF Employed"* Unemployment rate			0.009 (-0.016 - 0.035)	
4 "HD Out - WF Unemployed"* Unemployment			0.005 (-0.020 - 0.030)	
5 "HD Unemployed - WF OUT"* Unemployment			0.004 (-0.005 - 0.013)	
6 "HD Unemployed - WF Employed"*			-0.002 (-0.024 - 0.019)	
7 "Both Out"* Unemployment rate			0.021 (-0.026 - 0.069)	
8 "Both Unemployed"* Unemployment rate			0.019 (-0.004 - 0.041)	
1 "HD Employed - WF Out"*Very Low				-0.003 (-0.067 - 0.062)
1 "HD Employed - WF Out"*Low Unemployment				0.045 (-0.025 - 0.116)
1 "HD Employed - WF Out"*Middle				0.050 (-0.032 - 0.132)
2 "HD Employed - WF Unemployed"*Very Low				-0.043 (-0.157 - 0.071)
2 "HD Employed - WF Unemployed"*Low				-0.059 (-0.147 - 0.030)
2 "HD Employed - WF Unemployed"*Middle				0.098 (-0.098 - 0.293)
3 "HD Out – WF Employed"* Very Low				-0.114 (-0.284 - 0.056)
3 "HD Out – WF Employed"* Low				0.032 (-0.173 - 0.236)
3 "HD Out - WF Employed"* Middle				-0.078 (-0.254 - 0.099)
4 "HD Out - WF Unemployed" *Very Low				-0.025 (-0.153 - 0.103)
4 "HD Out - WF Unemployed" *Middle				-0.009 (-0.063 - 0.045)
5 "HD Unemployed - WF OUT"* Very Low				-0.016 (-0.075 - 0.042)
5 "HD Unemployed - WF OUT"* Low				-0.042 (-0.124 - 0.041)
5 "HD Unemployed - WF OUT"* Middle				-0.042 (-0.107 - 0.023)
6 "HD Unemployed - WF Employed"* Very Low				0.027 (-0.187 - 0.241)
6 "HD Unemployed - WF Employed"* Low				-0.035 (-0.196 - 0.126)
6 "HD Unemployed - WF Employed"* Middle				0.002 (-0.147 - 0.150)
7 "Both Out"* Very Low Unemployment (< 4.8%)				-0.150 (-0.375 - 0.074)

7 "Both Out"* Low Unemployment (4.8 - 5.8%)				0.013 (-0.355 - 0.380)
7 "Both Out"* Middle Unemployment (5.8% -				-0.170 (-0.391 - 0.050)
8 "Both Unemployed"* Very Low Unemployment				-0.141 (-0.327 - 0.044)
8 "Both Unemployed"* Middle Unemployment				-0.115 (-0.292 - 0.062)
Race: White (Ref. Cat.)				
Race: African American	-0.003 (-0.032 - 0.026)	-0.004 (-0.033 - 0.025)	-0.002 (-0.031 - 0.027)	-0.004 (-0.033 - 0.025)
Race: Other	0.040 (-0.022 - 0.102)	0.042 (-0.020 - 0.104)	0.040 (-0.023 - 0.102)	0.040 (-0.022 - 0.102)
Wife Age	-0.007*** (-0.008 - -0.005)	-0.006*** (-0.008 - -0.005)	-0.007*** (-0.008 - -0.005)	-0.006*** (-0.008 - -0.005)
Married (Ref Cat)				
Cohabiting	-0.070*** (-0.099 - -0.041)	-0.069*** (-0.098 - -0.040)	-0.071*** (-0.101 - -0.042)	-0.070*** (-0.100 - -0.041)
Divorced/Separated	-0.044* (-0.093 - 0.006)	-0.043* (-0.093 - 0.007)	-0.044* (-0.094 - 0.006)	-0.044* (-0.095 - 0.008)
Head High Education	0.021 (-0.012 - 0.054)	0.020 (-0.013 - 0.053)	0.022 (-0.011 - 0.055)	0.020 (-0.013 - 0.054)
Wife High Education	0.011 (-0.019 - 0.042)	0.012 (-0.018 - 0.042)	0.011 (-0.020 - 0.041)	0.010 (-0.020 - 0.040)
Constant	0.122*** (0.101 - 0.142)	0.116*** (0.088 - 0.144)	0.122*** (0.102 - 0.142)	0.116*** (0.084 - 0.148)
N	2,471	2,471	2,471	2,471
R-squared	0.031	0.033	0.032	0.037

Source: Elaboration of the author based on PSID data.

Note: Robust Confidence Intervals in parenthesis. ***p<0.01, **p<0.05, *p<0.10. State unemployment rate centered at the mean. Wife Age also mean-centered. Reference categories are High unemployment rate (>7.5%), being in a dual earner couple, being White non-Hispanic and being married.

Going back to the cross-sectional models in Tables 2-3, the estimates at the individual level seems much larger and robust to model specifications: compared to the dual earners, all other couples' combination have a smaller probability of first birth (except when the head is unemployed but the wife is working, where the point estimate are positive though very small in magnitude and they do not reach statistical significance). The largest negative correlation to first birth, compared to dual-earner couples is among unemployed-head, out of labor force-wife couples (-13%, Table 3.2) followed by the reversed combination (head out of labor force and wife unemployed: -10%, Table 3.2). The negative correlation for these couples is present before, during and after the recession (Table 3.3). When instead both members are non-working (either unemployed or out of labor force) the correlation to first birth is negative, and strongly so, only before the recession (Table 3.3).

Once we introduce the interaction between the macro- and micro-levels (Models 6-7 in Table 3.2) the interpretation of the constitutive terms of unemployment and couples' working status changes. In Model 6 the coefficient of aggregate unemployment now represents the effect of unemployment on first births for dual-earner couples, and the working-status combinations now represent the effect of the different combinations (compared to dual earners) when unemployment is at the mean (state unemployment rate is mean-centered). In Model 7 the reasoning is the same except that the reference category of unemployment now is high unemployment so that couples' working status coefficients now represent the effect of working combinations (compared to dual earners) on first birth, at high levels of unemployment.

When aggregate unemployment is at the average (Model 6 in Table 3.2) the negative correlations between couples' working-status combinations (different from dual earners) and first birth, illustrated before, peak (and being both unemployed becomes a significantly negative condition for childbearing compared to dual earners). In contrast, at very high levels of unemployment (Model 7 in Table 3.2) those same negative correlations are all reduced in magnitude.
The interaction terms, though very small and never statistically different from zero seem to also suggest some kind of moderator effect of aggregate unemployment, but given the complexity of the model, the lack of precision in the estimate and the cross-sectional nature of the analysis, it is difficult to draw definite conclusions on this point.
The same pattern is confirmed in the two-by-two years (Table 3.3): being both unemployed (or both out of the labor market) is negatively associated to first birth, compared to dual earners couples, in 2003/05 (-20%) - a period when unemployment was very low in the US - while the effect is halved four years later (-12% in 2007/09) and becomes zero (and imprecisely estimated) in 2009/11.
The only negative effect that seems to increase over time is that of couples where only the husband works (especially if the wife is out of the labor force).
Finally, since the constitutive terms of unemployment rates are very similar in Models 6-7 to the previous ones, it seems like the there is no specific effect on unemployment on dual earners compared to other typologies of couples' working status.

These findings are obtained controlling for couples observable characteristics: head's ethnicity, wife's age, head and wife's educational level and their marital status.
Being married is associated with a higher likelihood of first births compared to cohabiters, even though this is less so during the crisis (for cohabiters the likelihood of first birth is -10% 2003/05 versus -7% in 2009/11 compared to married couples) while surprisingly there is no significant association between race, or high education and the probability of becoming parents in the cross-sectional models. The only exception is in the period 2009/11 when couples where the husband is highly educated are associated with a greater probability of childbearing (+5%).
The results of the individual-level variables in the BE models (Table 3.4) are substantially very similar to the pooled cross-sectional regressions although the size of the point estimates is generally larger but in fewer cases they reach statistical significance. However, looking at the interaction models (Model 3-4 in Tab. 3.4) the estimates look quite different from the cross-sectional model and the recession seems to have a multiplicative negative effect of couples' working conditions on first births (even though the estimates are not statistically significant). In fact, if we compare the couple-variable correlations when unemployment rates are at the average (Model 3) to the estimates at high levels of unemployment (Model 4), in the latter the point estimates are always negative but larger compared to Model 3. The interaction terms seem to suggest the same even though, as said, they almost never reach statistical significance.

Table 3.3: Cross-sectional models of the probability of first birth combining waves before/after the crisis.

Dependent variable (Have First Child last year) in Year t - Independent variables lagged to Year t-2						
	2003/2005		2007/2009		2009/2011	
	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
State Unemployment rate	0.014		0.005		0.003	
	(-0.029 - 0.057)		(-0.013 - 0.024)		(-0.007 - 0.014)	
Very Low Unemployment (< 4.8%)		0.026		0.030		-0.056
		(-0.231 - 0.283)		(-0.040 - 0.099)		(-0.185 - 0.073)
Low Unemployment (4.8 - 5.8%)		-0.055		0.012		-0.100***
		(-0.302 - 0.192)		(-0.062 - 0.086)		(-0.147 - -0.054)
Middle Unemployment (5.8% - 7.5%)		0.002				0.000
		(-0.239 - 0.243)				(-0.047 - 0.047)
High Unemployment (> 7.5%) Ref. Cat.		-				-
1 "HD Employed - WF Out"	-0.087	-0.091	-0.066***	-0.066***	-0.073***	-0.074***
	(-0.202 - 0.029)	(-0.209 - 0.027)	(-0.116 - -0.017)	(-0.115 - -0.016)	(-0.111 - -0.034)	(-0.112 - -0.035)
2 "HD Employed - WF Unemployed"	-0.018	-0.028	-0.074*	-0.076*	-0.050	-0.049
	(-0.197 - 0.162)	(-0.214 - 0.159)	(-0.158 - 0.010)	(-0.159 - 0.008)	(-0.124 - 0.023)	(-0.123 - 0.025)
3 "HD Out - WF Employed"	-0.017	-0.019	-0.128***	-0.127***	-0.036	-0.033
	(-0.213 - 0.180)	(-0.216 - 0.178)	(-0.165 - -0.090)	(-0.165 - -0.089)	(-0.142 - 0.070)	(-0.140 - 0.075)
4 "HD Out - WF Unemployed"			-0.094**	-0.109**	-0.082***	-0.088***
			(-0.186 - -0.001)	(-0.202 - -0.015)	(-0.114 - -0.050)	(-0.120 - -0.056)
5 "HD Unemployed - WF OUT"			-0.147***	-0.138***	-0.113***	-0.109***
			(-0.216 - -0.077)	(-0.204 - -0.071)	(-0.151 - -0.075)	(-0.147 - -0.070)
6 "HD Unemployed - WF Employed"	-0.059	-0.054	0.021	0.023	0.004	0.003
	(-0.220 - 0.102)	(-0.214 - 0.105)	(-0.151 - 0.193)	(-0.149 - 0.196)	(-0.071 - 0.078)	(-0.071 - 0.078)
7 "Both Out"	-0.207***	-0.202***	-0.074***	-0.075***	0.038	0.037
	(-0.276 - -0.138)	(-0.273 - -0.131)	(-0.120 - -0.029)	(-0.119 - -0.031)	(-0.164 - 0.240)	(-0.166 - 0.240)
8 "Both Unemployed"	-0.202***	-0.204***	-0.124***	-0.119***	0.003	0.005
	(-0.278 - -0.126)	(-0.278 - -0.131)	(-0.189 - -0.058)	(-0.194 - -0.043)	(-0.178 - 0.184)	(-0.176 - 0.186)
Race: White (Ref. Cat.)	-	-	-	-	-	-
Race: African American	-0.028	-0.033	0.010	0.009	0.013	0.013
	(-0.127 - 0.071)	(-0.130 - 0.063)	(-0.042 - 0.062)	(-0.044 - 0.062)	(-0.033 - 0.059)	(-0.034 - 0.060)
Race: Other	0.104	0.108	0.044	0.047	-0.008	-0.007
	(-0.071 - 0.278)	(-0.064 - 0.280)	(-0.069 - 0.156)	(-0.067 - 0.160)	(-0.104 - 0.088)	(-0.102 - 0.089)
Wife Age	-0.009***	-0.008***	-0.007***	-0.006***	-0.006***	-0.006***
	(-0.014 - -0.003)	(-0.014 - -0.003)	(-0.009 - -0.004)	(-0.009 - -0.004)	(-0.009 - -0.004)	(-0.009 - -0.004)
Married (Ref Cat)	-	-	-	-	-	-
Cohabiting	-0.101*	-0.102*	-0.045	-0.042	-0.069***	-0.070***
	(-0.209 - 0.006)	(-0.209 - 0.004)	(-0.102 - 0.012)	(-0.100 - 0.015)	(-0.113 - -0.024)	(-0.115 - -0.025)
Divorced/Separated	-0.171***	-0.181***	-0.027	-0.030	0.041	0.041
	(-0.243 - -0.100)	(-0.259 - -0.103)	(-0.114 - 0.061)	(-0.118 - 0.059)	(-0.104 - 0.186)	(-0.104 - 0.187)
Head High Education	0.042	0.044	-0.002	-0.003	0.044*	0.045*
	(-0.059 - 0.143)	(-0.057 - 0.145)	(-0.068 - 0.064)	(-0.069 - 0.064)	(-0.006 - 0.094)	(-0.005 - 0.095)
Wife High Education	0.013	0.006	0.023	0.025	0.010	0.011
	(-0.077 - 0.104)	(-0.084 - 0.096)	(-0.039 - 0.085)	(-0.037 - 0.087)	(-0.034 - 0.054)	(-0.033 - 0.055)
Constant	0.193***	0.199*	0.120***	0.088**	0.092***	0.102***
	(0.129 - 0.257)	(-0.037 - 0.434)	(0.068 - 0.172)	(0.013 - 0.163)	(0.049 - 0.135)	(0.067 - 0.138)
Observations	390	390	705	705	836	836
R-squared	0.045	0.049	0.035	0.036	0.040	0.041

Source: Elaboration of the author based on PSID data.

Note: Robust Confidence Intervals in parenthesis. ***p<0.01, **p<0.05, *p<0.10. State unemployment rate centered at the mean. Wife Age also mean-centered. Reference categories are High unemployment rate (>7.5%), being in a dual earner couple, being White non-Hispanic and being married.

Table 3.4: Linear probability Between Effect models of the probability of first birth.

	Model (1)	Model (2)	Model (3)	Model (4)
State Unemployment rate	-0.012*** (-0.021 - -0.004)		0.006 (-0.004 - 0.017)	
Very Low Unemployment (< 4.8%)		0.099*** (0.040 - 0.157)		0.022 (-0.046 - 0.090)
Low Unemployment (4.8 - 5.8%)		0.097*** (0.031 - 0.164)		-0.015 (-0.085 - 0.054)
Middle Unemployment (5.8% - 7.5%)		0.123*** (0.064 - 0.182)		0.014 (-0.055 - 0.083)
High Unemployment (> 7.5%) Ref. Cat.				
1 "HD Employed - WF Out"	-0.109*** (-0.163 - -0.056)	-0.109*** (-0.162 - -0.056)	-0.098*** (-0.152 - -0.043)	-0.143** (-0.257 - -0.029)
2 "HD Employed - WF Unemployed"	-0.047 (-0.146 - 0.052)	-0.050 (-0.148 - 0.049)	-0.029 (-0.122 - 0.064)	-0.079 (-0.247 - 0.089)
3 "HD Out - WF Employed"	-0.024 (-0.125 - 0.076)	-0.031 (-0.131 - 0.069)	-0.018 (-0.113 - 0.077)	-0.154 (-0.379 - 0.071)
4 "HD Out - WF Unemployed"	-0.243 (-0.639 - 0.153)	-0.220 (-0.615 - 0.176)	-0.319 (-0.931 - 0.292)	-0.605 (-1.858 - 0.648)
5 "HD Unemployed - WF OUT"	-0.188* (-0.381 - 0.006)	-0.183* (-0.376 - 0.010)	-0.177 (-0.398 - 0.043)	-0.170 (-0.447 - 0.106)
6 "HD Unemployed - WF Employed"	0.038 (-0.053 - 0.128)	0.037 (-0.054 - 0.127)	0.047 (-0.047 - 0.141)	0.038 (-0.100 - 0.177)
7 "Both Out"	0.009 (-0.160 - 0.178)	0.013 (-0.155 - 0.182)	0.003 (-0.167 - 0.173)	0.148 (-0.141 - 0.437)
8 "Both Unemployed"	-0.083 (-0.317 - 0.150)	-0.066 (-0.299 - 0.166)	-0.104 (-0.373 - 0.165)	-0.085 (-0.409 - 0.239)
1 "HD Employed - WF Out"* Unemployment rate			-0.018 (-0.043 - 0.007)	
2 "HD Employed - WF Unemployed"* Unemployment rate			-0.018 (-0.057 - 0.022)	
3 "HD Out - WF Employed"* Unemployment rate			-0.027 (-0.070 - 0.016)	
4 "HD Out - WF Unemployed"* Unemployment rate			-0.078 (-0.311 - 0.154)	
5 "HD Unemployed - WF OUT"* Unemployment rate			-0.010 (-0.066 - 0.046)	
6 "HD Unemployed - WF Employed"* Unemployment rate			-0.012 (-0.044 - 0.021)	
7 "Both Out"* Unemployment rate			0.013 (-0.066 - 0.091)	
8 "Both Unemployed"* Unemployment rate			-0.005 (-0.081 - 0.072)	
1 "HD Employed - WF Out"*Very Low Unemployment (< 4.8%)				-0.023 (-0.189 - 0.144)
1 "HD Employed - WF Out"*Low Unemployment (4.8 - 5.8%)				0.110 (-0.087 - 0.308)
1 "HD Employed - WF Out"*Middle Unemployment (5.8% - 7.5%)				0.103 (-0.069 - 0.276)
2 "HD Employed - WF Unemployed"*Very Low Unemployment (< 4.8%)				-0.021 (-0.297 - 0.256)
2 "HD Employed - WF Unemployed"*Low Unemployment (4.8 - 5.8%)				0.018 (-0.306 - 0.342)
2 "HD Employed - WF Unemployed"*Middle Unemployment (5.8% - 7.5%)				0.187 (-0.088 - 0.462)
3 "HD Out - WF Employed"* Very Low Unemployment (< 4.8%)				0.069 (-0.286 - 0.424)
3 "HD Out - WF Employed"* Low Unemployment (4.8 - 5.8%)				0.363* (-0.001 - 0.728)
3 "HD Out - WF Employed"* Middle Unemployment (5.8% - 7.5%)				0.162 (-0.205 - 0.529)
4 "HD Out - WF Unemployed" *Very Low Unemployment (< 4.8%)				0.556 (-1.018 - 2.130)
4 "HD Out - WF Unemployed" *Middle Unemployment (5.8% - 7.5%)				-0.234 (-1.318 - 0.850)
5 "HD Unemployed - WF OUT"* Very Low Unemployment (< 4.8%)				-0.036 (-0.540 - 0.469)
5 "HD Unemployed - WF OUT"* Low Unemployment (4.8 - 5.8%)				-0.109 (-0.900 - 0.682)
5 "HD Unemployed - WF OUT"* Middle Unemployment (5.8% - 7.5%)				-0.085 (-0.693 - 0.523)
6 "HD Unemployed - WF Employed"* Very Low Unemployment (< 4.8%)				-0.011 (-0.319 - 0.297)
6 "HD Unemployed - WF Employed"* Low Unemployment (4.8 - 5.8%)				-0.210 (-0.589 - 0.168)
6 "HD Unemployed - WF Employed"* Middle Unemployment (5.8% - 7.5%)				0.071 (-0.158 - 0.300)
7 "Both Out"* Very Low Unemployment (< 4.8%)				-0.168 (-0.649 - 0.314)

7 "Both Out"* Low Unemployment (4.8 - 5.8%)				0.228
				(-0.302 - 0.759)
7 "Both Out"* Middle Unemployment (5.8% - 7.5%)				-0.676*
				(-1.432 - 0.081)
8 "Both Unemployed"* Very Low Unemployment (< 4.8%)				-0.085
				(-0.789 - 0.618)
8 "Both Unemployed"* Middle Unemployment (5.8% - 7.5%)				-0.040
				(-0.934 - 0.854)
Race: White (Ref. Cat.)				
Race: African American	0.005	0.002	0.000	-0.003
	(-0.033 - 0.043)	(-0.036 - 0.041)	(-0.039 - 0.039)	(-0.042 - 0.037)
Race: Other	0.041	0.037	0.043	0.042
	(-0.025 - 0.108)	(-0.029 - 0.103)	(-0.024 - 0.110)	(-0.026 - 0.111)
Wife Age	-0.009***	-0.009***	-0.009***	-0.009***
	(-0.012 - -0.006)	(-0.012 - -0.007)	(-0.012 - -0.006)	(-0.012 - -0.006)
Married (Ref Cat)				
Cohabiting	-0.070***	-0.062**	-0.075***	-0.071***
	(-0.118 - -0.023)	(-0.110 - -0.015)	(-0.123 - -0.027)	(-0.120 - -0.023)
Divorced/Separated	-0.050	-0.049	-0.054	-0.047
	(-0.144 - 0.045)	(-0.143 - 0.046)	(-0.149 - 0.042)	(-0.143 - 0.050)
Head High Education	0.022	0.023	0.021	0.020
	(-0.022 - 0.065)	(-0.020 - 0.066)	(-0.023 - 0.064)	(-0.024 - 0.063)
Wife High Education	0.012	0.012	0.011	0.008
	(-0.029 - 0.053)	(-0.028 - 0.053)	(-0.030 - 0.052)	(-0.033 - 0.050)
Constant	0.130***	0.051**	0.131***	0.124***
	(0.105 - 0.155)	(0.005 - 0.098)	(0.106 - 0.156)	(0.067 - 0.181)
N	2,471	2,471	2,471	2,471
R-squared	0.065	0.073	0.059	0.070
Number of numID	1,233	1,233	1,233	1,233

Source: Elaboration of the author based on PSID data.

Note: Robust Confidence Intervals in parenthesis. ***p<0.01, **p<0.05, *p<0.10. State unemployment rate centered at the mean. Wife Age also mean-centered. Reference categories are High unemployment rate (>7.5%), White non-Hispanic race and being married.

Up to this point we still do not know whether the cross-sectional correlations are spurious and only due to couples selecting into employment conditions based on some unobserved characteristics or attitudes that influences as well their propensity to have children, or whether the negative correlation between having one, or both, partners out of the labor market, really diminishes the likelihood of parenthood. In the next set of analyses I check whether these patterns highlighted in the difference between couples' typologies appear also within couples' typology over time, controlling for individual fixed effect.

Since the cross-sectional findings suggest that the effect of aggregate unemployment on first births seems to mask the large US states' variation more than the effect of employment insecurity on childbearing, I add to the FE analysis a control for state effect; in this way I am sure I am not absorbing any state-related effects on fertility in my estimates.[138] This is possible in the FE model because in the US internal migration is quite common. As such, state of residency is not a time-invariant variable and can be estimated. Moreover, there is a possibility that couples migrate from a high-unemployment rate state to a low-unemployment rate state to ameliorate their economic conditions and thus have their first child. As said, internal migration is quite common in the US, though the direction of the flow is traditionally from the northern East and Central regions to the southeast and West, but the latter are also the regions where unemployment grew larger in the years

[138] However, estimating the FE models without the state dummies does not change the results of the effects of the explanatory variables on first births.

considered here, and there is no apparent change of flow between the two regions (US Census 2014 report[139]). In the sample, in fact, there are 181 cases of migration, and 18 of them coincide with first birth episodes. Because these are significant numbers, besides including states' dummies to control for state-related fixed effect on fertility, as a robustness check, all the models have been also tested adding a migration dummy, equal 1 in case the couple resides in a different state than in the wave before. Results are not shown since both the coefficients and the standard errors of the explanatory and control variables are equivalent.[140]

Table 3.5 reports the results of the Fixed Effects (FE) model[141]: the former part shows aggregate- and individual-level employment covariates separately (Models 1-3), while the latter shows the cross-level combination (Models 4-5) and interaction (Models 6-7 in Table 3.5).

Controlling for couples' (and US state) fixed effect allows me to control for omitted couples and states' characteristics that are constant over time (this is also the reason why it is not possible now to control for ethnicity) in an attempt to moderate the selection effects in the estimates. However, increasing the complexity of the models reduces the precision of the estimates, especially given that the sample size is not very large (now around 2500).

First of all, the results of the FE models show robustly, as in the cross-sectional analyses, that the increase in aggregate unemployment per se is not substantially related to first births (and it is statistically not significant).

Second, the effect of the individual-level key explanatory variable – couples' employment status – is not always precisely estimated and confidence intervals are quite large. The problem of certain categories is that the cell size is very small. For instance there are only 7 couples in the group of head out of labor force with an unemployed wife, 26 couples in the both out of labor force category and 18 in the both unemployed one[142]. Notwithstanding the deterioration of the economy during the Great Recession these groups of couples where both members do not work remain quite rare and the cell size is too small to get statistically precise estimates. Regarding these couples the effect on first birth is difficult to comment on (they are the only groups for which the probability of childbearing gets larger compared to being dual earners).

The probability of first birth for all the other categories is negative compared to when couples are dual earners. The point estimates are a bit more precise even though for many of them still not enough to get to statistical significance. The strongest and more precisely estimated negative effect is found for couples when the wife is out of the labor market and the husband loses his job (-4% in probability

[139] Available at http://www.census.gov/newsroom/press-releases/2014/cb14-232.html

[140] Apart from the very simple model with only aggregate unemployment, where the migration dummy is significant and positive for childbearing, adding controls at the individual level erase the effect of migration.

[141] Since the between-variation seems important, I also ran Random Effects models, which are more efficient because they combine within- and between-estimates. However, the Hausman Test returned a chi-square of 121.71 and a p-value of 0.000, meaning that the fixed and random coefficients are systematically different (individual unobserved effects are correlated with regressors) and only the FE model returns unbiased estimates.

[142] Cells size:333 couples are HD employed – WF out of LF; 101 couples are HD employed – WF unemployed; 83 couples are HD out of FL – WF employed; 7 couples are HD out of FL – WF unemployed; 22 couples are HD unemployed – WF out of LF; 115 couples are HD unemployed – WF employed and finally in 26 couples both HD and WF are out of LF and in 18 they are both unemployed.

compared to when they are both employed in Models 3-5). Recalling from descriptive statistics (Figure 3.7 in Section 5) in these couples women are usually housewives (around 70%) or students (around 18%). The effect on first birth is also negative for couples when only the wife is employed compared to dual earners with a similar magnitude if the husband is unemployed or out of the labor force (-3% for categories 3 and 6 in Models 3-5) even though the point estimates are not statistically significant. Finally, if it is the wife who loses her job the likelihood of childbearing also declines compared to when both members of the couple are employed (around -3% for category 2 in Models 3-5).

But what happens at different levels of aggregate unemployment? As explained earlier, commenting on Table 3.2, from interaction Models 6-7 in Table 3.5, we can distinguish between the effect of couple-level employment status at average levels of unemployment[143] (Model 6) and at high levels of unemployment (Model 7).

Compared to periods of average (low) unemployment, when the latter increases to the highest quartile (>7.5%) the negative effect of an unemployed husband increases both if the wife is employed or is not (around -4-5% in categories 5 and 6). This is evident from the increase in the main effects in Model 7 compared to Model 6 but also from the negative sign of the interaction terms. As unemployment rises the probability that a couple has a first child declines even faster compared to dual earners if the husband becomes unemployed (slightly more strongly when the wife is out of the labor force but this is true even when she is employed). The interaction terms with unemployment quartiles are a bit more complicated to interpret but I do find a confirmation of the results just described (the couples categories 5 and 6 have positive interaction terms): when unemployment is low (around 5-6%), for instance, the negative effect of an unemployed husband instead of a working one is 'less negative' compared to periods of large unemployment.

This finding is in contrast to the cross-sectional results, which showed a moderator effect of aggregate unemployment. To recall, the results of the cross-sectional models (Table 3.2) showed that when, or where, unemployment rates are higher, the larger probability of having a first child for dual-earner couples - compared to other types of couples' working-status combinations - is reduced, in comparison to periods, or states, where unemployment is lower.

This indicates that, as suggested by the literature, a process of selection on unobserved characteristics is at play in the relationship between labor market outcomes and the transitions to first births. In the cross-sectional setting in fact, the estimates of the effect of aggregate unemployment on the effect of couples employment status on the probability of having the first child do not distinguish between, first, the case of different couples facing different aggregate labor market conditions and, second, the case of the same couple facing a change in the aggregate conditions over time. In the first case, some dual-earner couples could, for instance, have moved to states where unemployment is lower because they

[143] Aggregate unemployment is mean-centered.

are particularly career oriented and less generally prone to have children. If this happens, the cross-sectional estimate of a negative effect of unemployment rates on the (positive) correlation between being a dual-earner couple and having a first child would be explained by this attitude of dual-earner couples to prioritize work over family, rather than on the effect of aggregate unemployment itself on the relationship between couples' working dynamics and childbearing.

The fixed effect estimates, as already mentioned (see Section 3.2), suffer much less from this couples' (work versus family) attitude-related confounders because they control for couples' time-invariant characteristics that might affect both their likelihood of moving depending on the aggregate macroeconomic conditions or of being in a specific working-couples' situation and their likelihood of having children. As mentioned earlier, there are two strong assumptions that I have to make here in order to identify the effect: first that couples are homogamous in those attitudes and controlling for the couple fixed effect is correct and, second, that those unobserved attitudes do not change over time.

The bottom line of the FE results is that if the husband becomes unemployed the probability of first birth declines (especially if the wife is out of the labor force), and the negative effect increases at high levels of unemployment (see Model 7 in Table 3.5). Moreover, couples where the husband works but the wife does not also face a smaller probability of parenthood compared to dual-earner couples. This finding points to a predominant income effect over any opportunity-cost effect, namely that couples' job insecurity is responsible for the decision to postpone childbearing, and this pattern seems to be more and more important as we enter into the recession period. I do not find support for hypothesis of a difficult reconciliation of family/work life for women: they have the largest probability of becoming mothers when they are at work, and their partner is employed too.

Finally, as far as controls are concerned, in the FE models education, unlike in the BE and cross-sectional estimates, is quite relevant: if the head of the family moves to college the chances that the couple has their first child within the following two years increase by 3-4%, while the opposite is true if his partner, the wife, moves to higher education (the probability declines 5-6%). Once I introduce the employment status explanatory variable the effects of both wife's and head's education become stronger but the latter not statistically significant. Whether instead they move from cohabiting to marriage seems to increase the chances of parenthood but the point estimate is again imprecisely estimated and small in magnitude, compared to the cross-sectional and BE model results. The reason could be that marriage is still a very strong mechanism of selection, thus controlling for individual fixed effect moderates the impact of marriage itself on childbearing. However marriage rates are largely influenced by the recession and by employment insecurity in general, therefore, marital status might have an important mediating effect of the crisis on childbearing.

Table 3.5: Linear probability Fixed Effect models. Micro and macro employment variables (US States FE).

	Model (1)	Model (2)	Model (3)
State Unemployment rate	-0.001		
	(-0.006 - 0.004)		
Very Low Unemployment (< 4.8%)		0.009	
		(-0.025 - 0.043)	
Low Unemployment (4.8 - 5.8%)		-0.006	
		(-0.035 - 0.024)	
Middle Unemployment (5.8% - 7.5%)		-0.001	
		(-0.035 - 0.034)	
High Unemployment (> 7.5%) Ref. Cat.		-	
Dual Earners (Ref. Cat.)			-
1 "HD Employed - WF Out"			-0.008
			(-0.036 - 0.020)
2 "HD Employed - WF Unemployed”			-0.026
			(-0.090 - 0.038)
3 "HD Out - WF Employed"			-0.035
			(-0.132 - 0.063)
4 "HD Out - WF Unemployed”			0.004
			(-0.050 - 0.059)
5 "HD Unemployed - WF OUT"			-0.036**
			(-0.067 - -0.005)
6 "HD Unemployed - WF Employed"			-0.026
			(-0.078 - 0.027)
7 "Both Out"			0.027
			(-0.032 - 0.085)
8 "Both Unemployed”			0.067
			(-0.072 - 0.205)
WIFE AGE	0.017***	0.016***	0.016***
	(0.011 - 0.022)	(0.010 - 0.022)	(0.012 - 0.021)
Married (Ref Cat)			
Cohabiting	-0.018	-0.017	-0.019
	(-0.085 - 0.049)	(-0.084 - 0.051)	(-0.086 - 0.049)
Divorced/Separated	0.038	0.037	0.036
	(-0.018 - 0.095)	(-0.018 - 0.093)	(-0.019 - 0.091)
Head High Education	0.026***	0.027***	0.051
	(0.009 - 0.043)	(0.009 - 0.046)	(-0.028 - 0.131)
Wife High Education	-0.046***	-0.054***	-0.061*
	(-0.080 - -0.013)	(-0.090 - -0.019)	(-0.122 - 0.001)
US State FE	YES	YES	YES
Constant	-0.001	0.002	0.009
	(-0.273 - 0.272)	(-0.276 - 0.280)	(-0.260 - 0.278)
N	2505	2505	2487
R-squared	0.089	0.090	0.091
Number of numID	1,56	1256	1243

Source: Elaboration of the author based on PSID data.
Note: Robust Confidence Intervals in parenthesis. ***p<0.01, **p<0.05, *p<0.10. State unemployment rate centered at the mean.
Wife Age also mean-centered. Reference categories are High unemployment rate (>7.5%), being in a dual earner couple and being married.

Table 3.5 cont'd: Linear probability Fixed Effect models. Micro and macro employment variables (US States FE).

	Model (4)	Model (5)	Model (6)	Model (7)
State Unemployment rate	-0.001 (-0.006 - 0.004)		-0.001 (-0.007 - 0.005)	
Very Low Unemployment (< 4.8%)		0.007 (-0.028 - 0.042)		0.006 (-0.039 - 0.051)
Low Unemployment (4.8 - 5.8%)		-0.009 (-0.038 - 0.021)		-0.015 (-0.052 - 0.021)
Middle Unemployment (5.8% - 7.5%)		-0.004 (-0.039 - 0.031)		0.005 (-0.037 - 0.048)
High Unemployment (> 7.5%) Ref. Cat.		-		-
Dual Earners (Ref. Cat.)	-	-	-	-
1 "HD Employed - WF Out"	-0.008 (-0.036 - 0.020)	-0.009 (-0.037 - 0.019)	-0.006 (-0.034 - 0.022)	-0.040** (-0.079 - -
2 "HD Employed - WF Unemployed"	-0.026 (-0.089 - 0.038)	-0.028 (-0.092 - 0.036)	-0.027 (-0.090 - 0.036)	-0.001 (-0.095 - 0.093)
3 "HD Out - WF Employed"	-0.034 (-0.131 - 0.063)	-0.036 (-0.132 - 0.061)	-0.040 (-0.136 - 0.056)	0.098 (-0.079 - 0.274)
4 "HD Out - WF Unemployed"	0.007 (-0.048 - 0.062)	0.011 (-0.046 - 0.068)	-0.018 (-0.077 - 0.042)	0.074 (-0.038 - 0.185)
5 "HD Unemployed - WF OUT"	-0.035** (-0.065 - -	-0.034** (-0.067 - -	-0.007 (-0.046 - 0.031)	-0.051* (-0.108 - 0.006)
6 "HD Unemployed - WF Employed"	-0.024 (-0.078 - 0.031)	-0.025 (-0.079 - 0.030)	-0.007 (-0.072 - 0.058)	-0.039** (-0.070 - -
7 "Both Out"	0.027 (-0.032 - 0.086)	0.028 (-0.031 - 0.088)	0.027 (-0.048 - 0.102)	0.071 (-0.132 - 0.274)
8 "Both Unemployed"	0.069 (-0.069 - 0.207)	0.065 (-0.074 - 0.205)	0.046 (-0.033 - 0.126)	0.104 (-0.185 - 0.393)
1 "HD Employed - WF Out"* Unemployment rate			-0.007* (-0.015 - 0.001)	
2 "HD Employed - WF Unemployed"* Unemployment rate			0.009 (-0.019 - 0.037)	
3 "HD Out - WF Employed"* Unemployment rate			0.028* (-0.002 - 0.059)	
4 "HD Out - WF Unemployed"* Unemployment rate			0.021 (-0.009 - 0.051)	
5 "HD Unemployed - WF OUT"* Unemployment rate			-0.014** (-0.027 - -	
6 "HD Unemployed - WF Employed"* Unemployment rate			-0.013 (-0.028 - 0.002)	
7 "Both Out"* Unemployment rate			0.011 (-0.022 - 0.045)	
8 "Both Unemployed"* Unemployment rate			0.010 (-0.034 - 0.054)	
1 "HD Employed - WF Out" *Very Low Unemployment (< 4.8%)				0.032 (-0.022 - 0.086)
1 "HD Employed - WF Out" * Low Unemployment (4.8 - 5.8%)				0.081*** (0.036 - 0.125)
1 "HD Employed - WF Out" *Middle Unemployment (5.8% - 7.5%)				0.033 (-0.027 - 0.093)
2 "HD Employed - WF Unemployed"*Very Low Unemployment (< 4.8%)				0.005 (-0.134 - 0.144)
2 "HD Employed - WF Unemployed"* Low Unemployment (4.8 - 5.8%)				-0.087 (-0.288 - 0.114)
2 "HD Employed - WF Unemployed"*Middle Unemployment (5.8% -				-0.034 (-0.172 - 0.104)
3 "HD Out - WF Employed"*Very Low Unemployment (< 4.8%)				-0.197* (-0.410 - 0.015)
3 "HD Out - WF Employed"* Low Unemployment (4.8 - 5.8%)				-0.170 (-0.404 - 0.063)
3 "HD Out - WF Employed"*Middle Unemployment (5.8% - 7.5%)				-0.186* (-0.388 - 0.015)
4 "HD Out - WF Unemployed"*Very Low Unemployment (< 4.8%)				-0.141 (-0.331 - 0.049)
4 "HD Out - WF Unemployed"* Low Unemployment (4.8 - 5.8%)				-
4 "HD Out - WF Unemployed"*Middle Unemployment (5.8% - 7.5%)				-0.106* (-0.217 - 0.004)
5 "HD Unemployed - WF OUT"*Very Low Unemployment (< 4.8%)				0.047 (-0.029 - 0.123)
5 "HD Unemployed - WF OUT"* Low Unemployment (4.8 - 5.8%)				0.121** (0.023 - 0.219)
5 "HD Unemployed - WF OUT"*Middle Unemployment (5.8% - 7.5%)				0.010 (-0.065 - 0.085)
6 "HD Unemployed - WF Employed"*Very Low Unemployment (< 4.8%)				0.140 (-0.048 - 0.329)

6 "HD Unemployed - WF Employed"* Low Unemployment (4.8 - 5.8%)				0.115**
				(0.023 - 0.208)
6 "HD Unemployed - WF Employed"*Middle Unemployment (5.8% -				-0.078
				(-0.211 - 0.055)
7 "Both Out"*Very Low Unemployment (< 4.8%)				-0.057
				(-0.265 - 0.151)
7 "Both Out"* Low Unemployment (4.8 - 5.8%)				-0.060
				(-0.252 - 0.132)
7 "Both Out"*Middle Unemployment (5.8% - 7.5%)				-0.049
				(-0.253 - 0.155)
8 "Both Unemployed"*Very Low Unemployment (< 4.8%)				-0.118
				(-0.411 - 0.176)
8 "Both Unemployed"* Low Unemployment (4.8 - 5.8%)				-
8 "Both Unemployed"*Middle Unemployment (5.8% - 7.5%)				-0.069
				(-0.364 - 0.226)
WIFE AGE	0.017***	0.016***	0.017***	0.016***
	(0.011 - 0.023)	(0.010 - 0.022)	(0.011 - 0.023)	(0.010 - 0.022)
Married (Ref Cat)				
Cohabiting	-0.019	-0.017	-0.017	-0.017
	(-0.086 - 0.049)	(-0.085 - 0.051)	(-0.086 - 0.052)	(-0.086 - 0.052)
Divorced/Separated	0.036	0.035	0.032	0.035
	(-0.020 - 0.092)	(-0.019 - 0.090)	(-0.023 - 0.088)	(-0.020 - 0.091)
Head High Education	0.050	0.050	0.095	0.098
	(-0.029 - 0.129)	(-0.027 - 0.128)	(-0.031 - 0.221)	(-0.041 - 0.237)
Wife High Education	-0.056*	-0.063*	-0.083*	-0.097*
	(-0.121 - 0.010)	(-0.127 - 0.001)	(-0.176 - 0.011)	(-0.197 - 0.003)
US State FE	YES	YES	YES	YES
Constant	0.002	0.007	-0.018	-0.012
	(-0.270 - 0.273)	(-0.270 - 0.284)	(-0.297 - 0.261)	(-0.279 - 0.254)
N	2,487	2,487	2,487	2,487
R-squared	0.092	0.092	0.100	0.109
Number of numID	1,243	1,243	1,243	1,243

Note: Robust CI in parenthesis. ***p<0.01, **p<0.05, *p<0.10. State unemployment rate centered at the mean. Wife Age also mean-centered. Reference categories are High unemployment rate (>7.5%), being in a dual earner couple and being married. Source: Elaboration of the author based on PSID data.

7. Conclusions

This third chapter addresses the impact at the micro-level of the Great Recession on the transition to the first child among couples in the US. At the macro-level, as pointed out in Chapter II, we observed a significant negative correlation between rising unemployment rates and TFR. From this starting point, Chapter III advances the analysis, looking at the micro-effects of the recession on childbearing. In particular it points at the manifest growing difficulties in the labor market in the period 2008-2010, and how they affect the entry into parenthood for American couples.

The couples' perspective has proven to be important in studies of family dynamics to which the traditional male-breadwinner model seems not to apply anymore, given the epochal societal changes that turned around women's role and gender relations in the last decades. Today, women's position in the labor market is in most cases as relevant as their partners' position in shaping household behavior. Clearly, this does not mean that the mechanisms are equal: the two members and their labor market statuses might still matter in very different ways in the couple's decision to become parents; but the latter is an additional reason for calibrating the analysis on the couple.

Based on data from the last five waves (2003-2011) of the Panel Study of Income Dynamics, one of the longest and most detailed longitudinal household surveys existent, the analysis aims at disentangling the diverse effects of macro- and micro-labor market variations on the probability of having a first child. Some of the many individual-level mechanisms, described in detail in Section 2, are in the backdrop of the analysis, like the opportunity cost or income effects, but also the less-known adverse effect and the uncertainty-reduction mechanisms. The latter is the only one which predicts a counter-cyclical reaction of fertility to economic and employment insecurity.

The analysis proceeds even further, testing whether the two levels interact. Two conflicting hypotheses follow: first, the macro- and micro-levels might affect first births in same direction or, second, they might operate in opposition to each other. In the former hypothesis, and assuming that insecurity in the labor market is harmful for fertility, there is a multiplicative negative effect of being out of the labor market during the recession when unemployment rates are large, most likely due to a pessimistic view of future job opportunities. In the opposite hypothesis, instead, the stigma of individual unemployment is mitigated by the fact that it is a widespread and shared condition (attenuation effect).

The results are presented in Section 6 first from the naïve cross-sectional analyses and the Between Effects models, and subsequently from a linear probability fixed effects model of the likelihood for different typologies of couples to have their first child, to identify any mechanisms of selection on unobservable characteristics in the cross-sectional estimates.

The deterioration in aggregate conditions, at least as measured here, in the time period analyzed, does not seem to have the negative effect on first birth found in the aggregate analysis on TFR of Chapter II. Increasing state-unemployment rate per se does not affect, either positively or negatively, the probability of having a first child, beyond the channel of individual-level employment status. The result is robust to any model specification (both if unemployment is introduced linearly or in quartiles) once controlling for couples'-level characteristics and their US state of residency. Similar results are found by Lange et al. (2014) for the Netherlands, where the negative effect of aggregate unemployment appears only for the likelihood of marriage but not for first births.

Regarding couples' employment combinations, the results between the cross-sectional, the BE and the FE analyses are very different.

Comparing across couples typologies without taking into consideration the longitudinal structure of the date (cross-sectional and BE analyses) the estimates show that any couple's working status combination, compared to the dual earners, have a lower likelihood of first birth (except when she works and he is unemployed) but these negative effects seem to be attenuated by the diffusion of unemployment (only in the cross-sectional analyses).

These are naïve estimates, however, that do not take into consideration that couples select themselves into contextual and employment conditions according to some unobserved characteristics that might also influence their propensity to have children.

For this reason I also conducted a FE analysis, exploiting the panel structure of the PSID dataset and controlling for couples (and state) fixed effect, to control as much as possible for time-invariant factors that might affect both employment and childbearing.

The results are indeed different: compared to dual earners, the couples showing the smallest probability of first birth are those where the husband becomes unemployed, independently of the wife's status[144]. Moreover, the negative effect increases at high levels of aggregate unemployment, suggesting a multiplicative effect of the recession on top of individual job market insecurity. Finally, when unemployment rates rise, even in the case where the husband is employed, if the wife goes out of the labor force (starts studying or becomes a housewife are the two most common possibilities) their probability of parenthood also declines compared to the dual earners.

In a previous study on the US, Lindo (2010) found, for the period from the seventies to the nineties, that male job loss decreases completed fertility (in the long run, 3-8 years after the job loss) of married couples but actually increases fertility for them in the short run. These results suggest that while the opportunity cost of childbearing might have been more relevant in the short term, the income effect of unemployment prevailed in long-term decisions. However, the present analysis, conducted on data of

[144] The category of both unemployed is too small to draw substantial conclusions on this group of couples.

a very different historical period compared to those of Lindo (2010), does not support the opportunity-cost hypothesis in the short-run either, according to which I should have found a positive effect for one of the two categories of head- or wife-only working (especially for the heads working couples with wives out of the labor force). I do find instead results similar to those of Vignoli et al. (2012) in Italy, where all couples' job combinations different from the dual earners depress births.

There also seems to be no support for the counter-cyclical fertility (or uncertainty-reduction) hypothesis since insecure positions lead to a smaller probability of parenthood, a result that, instead, suggests an explanation based on the income effect. The negative effect on childbearing of men (or of women but the estimates are smaller) losing their job points to a reduction of couple's job insecurity, earnings and income, compared to dual earners, who in comparison might have less time but certainly have more money and better future economic prospects. This seems also to become more relevant as the aggregate employment conditions deteriorate.

The income effect is usually very strong but since the Great Recession largely affected the young strata of the working population, I would not exclude the presence of the adverse effect too, maybe concentrated on the youngest couples[145]. A more detailed investigation of the effects across different age or tenure groups, maybe differentiating between the first and later occupations (young versus experienced workers) would be necessary to assess the relevance of the adverse-effect mechanism on these estimates.

[145] For instance, found that young adults 18-24 years old in Europe during the Great Recession faced the hardest time in the job market, being hit by the strongest increase in youth unemployment rates, but also they faced an increase in poverty rates and an increase in the perceived economic deprivation. This has also an impact in the proportion of young adults that can leave the parental house and establish a new independent household (Aassve et al 2013).

CHAPTER IV

INTERGENERATIONAL MOBILITY DURING THE GREAT RECESSION: THE EASTERLIN HYPOTHESIS.
THE IMPACT ON THE TRANSITION TO MOTHERHOOD FOR AMERICAN WOMEN.

1. Introduction

The interaction between the individual employment position and the aggregate job market environment, investigated in Chapter III, could be interpreted as a test of whether couples, especially in particular situations, tend to take decisions based not only on their own absolute status but also in relation to the larger community's conditions. When uncertainty looms, individuals find it harder to evaluate costs and benefits of any given choice, or to evaluate the gravity of a situation. Therefore they might refer to other people's conditions to evaluate their own, or to other people's decisions to take theirs. Chapter III shows only modest evidence that individuals are conditioned by state-level aggregate structural conditions such as unemployment rates: the latter per se does not seem to influence the probability of first birth but I find indications of a (moderate) multiplicative negative income effect on first birth for couples in which one of the two partners loses the job. Rising aggregate uncertainty signal to couples that their employment difficulties might not be just a temporary shock but rather an enduring condition; therefore they tend to postpone family commitment and parenthood even further.

Another comparison that individuals might make in the decision-making process of becoming parents is with respect to their past experience, most likely their experience as young adults in their family of origin. The expectations individuals have, or the role model with whom they naturally tend to identify and evaluate themselves is that provided by their parents.

Moreover, individual uncertain economic and employment conditions might be viewed as normatively and materially incompatible with the entry into parenthood[146]. For instance, Oppenheimer (1988) saw in the declining economic prospects of young men during the eighties and nineties an important reason for the decline in marriage rates (Kalmijn 2011). Deterioration in men's economic potential reduces their attractiveness in the marriage market because an unstable career signals uncertainty (or immaturity) as to whether the potential husband will be able to financially maintain a family (Oppenheimer 1988; Kalmijn 2011). The broader argument is that couples might postpone marriage and parenthood until they have "established a relatively solid position in the labor market" (Vignoli et al. 2012:42; Bernardi and Nazio 2005)[147].

One possible view on this issue comes from social mobility theory and it also brings the argument back to my previous point on the formation of individuals' future expectations and aspirations. What I refer to within the social mobility theoretical framework is the positional aspiration theory regarding the decision strategy (common to different social classes) to avoid downward mobility with respect to one's own class of origin (Boudon 1974; Goldthorpe and Breen 1997; Goldthorpe 1996, 2000).

The bottom line of these arguments, and the assumption at the basis of this chapter's investigation, is that individuals see as a precondition to start a family to be at least in the socioeconomic position of their parents, seeing their standard of living as a threshold to reach before entering parenthood.

The aim of this chapter is precisely to investigate whether women decide to have their first child based not in their absolute employment or socioeconomic placement, as was done in Chapter III, but on their intergenerational relative socioeconomic (occupational) position.

During the seventies, the American economist Richard A. Easterlin developed a theory to model the impact of the business cycle on fertility behavior. The original model hypothesized that changes in the age structure of a population influence fertility rates via the relative cohort size. Relative cohort size influences the degree of labor-market competition and therefore the disposable income of a cohort with respect to the previous one.

The imbalance created between the possibilities of one generation compared to those of the previous generation, was deemed to be responsible for the fluctuations in the fertility rate after the Second World War in the US (Easterlin 1961, 1976, 1980). At the micro-level the argument is that fertility decisions are taken based on a relative measure of the individual's socioeconomic status, which is the amount of disposable resources relative to his or her socioeconomic aspirations (or the alleged minimal threshold of standards of living), that are formed in the family of origin. When this intergenerational relative socioeconomic status is in favor of the younger generation, or at least stable, their fertility would increase, otherwise they will postpone childbearing until aspirations are fulfilled.

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146 This argument is similar to the one at the basis of the 'adverse effect' mechanism of transmission of uncertainty from the work to the family domain illustrated in Chapter II. The same normative mechanism of reaching financial independence before setting up a family was defined as the 'affordability clause' by Rindfuss and VandenHeuvel (1990) in a study of marriage and cohabitation in the US (see Section 2.1 in Chapter II for a detailed examination). However, in my investigation I do not only refer to young adults entering the labor market but to the more general economic and employment uncertainty common to individuals with different working tenure during periods of financial and economic hardship. Therefore I do not specifically refer to this mechanism throughout the chapter.

147 However, the definition of what it means to afford the commitment to family and childbearing means very different things depending on the individual's characteristics such as religion, race and social class (Rindfuss and VandenHeuvel 1990).

Exactly as it is assumed by the positional aspiration theory of social mobility mentioned above, the necessary condition to start a family is to avoid intergenerational downward socioeconomic mobility. However, the current economic downturn reduces individuals' disposable income, compared to the ideal socioeconomic standard created during adolescence in their families. During a recession it is more arduous for adult children to reach the socioeconomic position of their parents and thus fulfill their own aspirations. The context in which young individuals begin their working careers is, in fact, much more complex; they face fewer and less-rewarding occupational opportunities compared to that of their parents, and their future financial and career prospects are not better. These adverse conditions are often cited as a reason why young adults postpone the exit from the family of origin and their own family formation (Meron and Widmer 2002).

Before the onset of the Great Recession, findings concerning the trend in intergenerational mobility in the US were mixed. In a recent review of the literature, Florentia Torche (2015) suggests that in a context of growing inequality like the US, the most solid studies based on administrative data do not find any significant variation in the intergenerational mobility between the cohorts born between the seventies and the nineties (Chetty et al. 2014). In contrast, an increase in intergenerational mobility among men born in older cohorts (1950s-1970s) is found in studies using the Panel Study of Income Dynamics (PSID) (Fertig 2003; Mayer and Lopoo 2004; Hertz 2007; Lee and Solon 2009). However, other studies based on the National Longitudinal Surveys (NLS) show a decline in mobility for cohorts born between the 1940s and the 1960s (Levine and Mazumder 2002; Bloome and Western 2011).

Finally, to the best of my knowledge, there are no specific studies on households' intergenerational mobility during the Great Recession, excepting the November 2013 issue of *The Annals* of the American Academy of Political and Social Science on the effects of the Great Recession. The latter includes articles from psychologists, economists, sociologists and political scientists (among others) dealing with the various effects of the recession for American households, workers and children. It is interesting for the present discussion because it addresses – though separately – issues like mobility, socioeconomic status and the effects of the recession. In particular, Cherlin et al. (2013) investigated the consequences of the economic and financial crisis on family dynamics. The authors find that the proportion of young married couples living in extended families with parents is very small although the authors also show that married young men (25-29 years old) living with their family of origin increase by about 5% between 2007 and 2011 (Cherlin et al. 2013; Danziger 2013). They also report the results from a Pew Research study of 2010 showing that 24% of young adults age 18-29 have moved back to their parents' houses. Finally, the authors find a strong association with economic status: educated young adult with more resources and experiencing less unemployment are less likely to live with parents. These findings suggest that during the crisis it is difficult for young individuals and couples to live independently of their family of origin, from which they seek assistance and find financial and practical help.

In the same issue of *The Annals*, Pfeffer and colleagues (2013) investigated the changes in socioeconomic status of American families after the Great Recession. In their article, they show an extraordinary decline in household wealth due to the downfall of housing prices, stock prices, and the escalation in unemployment (see also Danziger 2013). They study in particular the distribution of wealth across different socioeconomic groups during the crisis and the first years of recovery. All groups suffered losses in wealth, but the more disadvantaged socioeconomic groups, in terms of ethnicity, education, pre-recession income and wealth, suffered the greatest losses. In the period 2007-2011 one-fourth of American households lost at least 75% of their wealth, while more than a half of them lost at least 25% of their wealth. These losses were disproportionately concentrated among low-educated, low-income minority households, generating a substantial and sudden rise in inequality. Notwithstanding the change in income and wealth, longitudinal studies, though, show little change in household mobility in the distribution.

Studies of the interaction between employment or socioeconomic status and first birth usually proxy the socioeconomic status with education, which measures only part of it, leaving aside the occupational and earnings structure within educational levels. Moreover, the results of these studies on the differential educational effects of employment insecurity on childbearing are far from conclusive. For instance, Kreyenfeld and Andersson (2014) look at the transition to first birth and the impact of employment status interacted with education in Denmark and Germany. They find that unemployment reduces the risk of first birth for tertiary-educated women, while among low-educated, the risk is 50% higher for unemployed women, compared to employed ones. In contrast, Meron and Widmer (2002) find for France that as unemployment and intermittent employment become normal facts in life (as in younger cohorts) they tend to have the same negative effect on first birth for highly educated women, but the effect is also negative and stronger on the least educated (who are more severely hit by unemployment).

Empirical research regarding the effects for fertility of both the social mobility and the Easterlin hypotheses has been modest, especially in the last two decades, probably in light of the fact that early studies concerning both hypotheses received highly mixed support.

The studies carried out around the time when the theories were developed seems to support the idea that mobility per se has no effect on fertility and, if anything, that intergenerational upward mobility negatively affects the likelihood of childbearing (in support of the status-enhancement mechanism). In contrast, more recent studies such as Bernardi (2007) find evidence that individuals do compare resources and aspirations formed in the family of origin and that upward occupational mobility with respect to the family of origin increases the likelihood for parenthood. However, in a very different setting and looking only at symmetric mobility Zang (2008) finds that mobility depresses complete

fertility.
While the theoretical development of the link between social mobility and fertility has been very well established, it is impossible to draw definite conclusions on the basis of existing empirical evidence.
The present chapter goes into this direction of trying to shed light on the link between mobility and fertility on the empirical grounds. The study attempts to do so by investigating the impact of intergenerational occupational mobility on the transition to first birth for American women in a period of increasing economic and employment uncertainty due to the onset of the Great Recession, thus adding another determinant to the model of fertility as a function of socioeconomic resources, aspirations and social mobility.
After this introduction, the remainder of this chapter is organized as follows: the next section provides the theoretical background to the investigation of the nexus between intergenerational mobility and the Easterlin Hypothesis, and fertility. Section 2 further illustrates the empirical evidence available on this theoretical nexus. Section 3 presents the statistical model and the dataset on which the following analysis is based. The descriptive results are reported in Section 4, while the multivariate Event History analyses are provided in Section 5. Finally, Section 6 draws the conclusions to this chapter.

2. Theoretical background and empirical research

2.1. Theoretical background

The theoretical framework of this chapter is based on a similar concept coming from two different streams of research: social mobility theory (Boudon 1974; Goldthorpe 1996; Been and Goldthorpe 1997) and the aspiration and resources hypothesis developed by the American economist Richard Easterlin (1961; 1976).

Both theoretical models make the crucial assumption that the individual makes strategic decisions (in education in the former theory and in childbearing in the latter) grounding their choices on their socioeconomic aspirations. Moreover, both theories also assume that these socioeconomic aspirations are formed in the individual's family of origin.

In this section I outline this main theoretical idea on which the analyses in this chapter is based and show how it has developed in the respective fields, starting from social mobility (in Section 2.1.1) and moving then to the Easterlin Hypothesis of aspirations and resources (in Section 2.1.2).

In the following subsection (2.2) I further illustrate the main empirical findings in the research on social mobility and fertility, and the numerous applications in the literature of Easterlin's model.

2.1.1. Intergenerational mobility

The social mobility assumption I refer to in this chapter was developed (starting from the positional theory of aspiration by Keller and Zavalloni 1964) in an attempt to explain why, despite educational expansion, social class inequality in educational attainment remained constant[148] over time, and similar across countries (Boudon 1974; Goldthorpe 1996, 2000; Breen and Goldthorpe 1997). Breen and Goldthorpe (1997, 2000) identified three mechanisms in their rational action model through which class differentials in educational attainment arise (and persist): first, a common relative risk aversion but, second, social class differences in ability and, third, different class endowment of resources. The first assumption concerns the class-common formation of aspirations: families in all classes similarly seek to ensure that their children acquire a class position that is at least as advantageous as their class of origin; namely they seek to avoid downward mobility with respect to parents. This means families in all classes have the same relative risk aversion.

In psychology, Kahneman and Tverky's (1979) make a similar argument in developing the prospect theory[149] according to which individuals' utility curves are more sensitive to losses compared to gains. In other words, losses are valued more negatively than gains are positively valued.

Even though not the focus of this specific study, it is worth mentioning that there are two other competing theoretical explanations regarding mobility strategies and the formation of aspirations in families of different classes. The first theory also views individuals' strategies as identical across social classes, but more in general posits that individuals aim to move from less to more desirable positions; while the second theory asserts that there might be cultural reasons for not pursuing more individually desirable class positions. For instance individuals from the working class might not be seeking individual success and achievement because they pursue other values, such as the family or solidarity, and they see personal interest as hindering these community values (Goldthorpe 2000: 241-2).

In contrast, the positional or structural theory of aspirations (Keller and Zavalloni 1964; Boudon 1974; Goldthorpe 1996) argues that class differences in educational or occupational aspirations do not depend on class values, or class-specific culture, but rather on structural factors.

This implies that individuals' goals should not be measured in absolute terms (as cultural aspirations) but relative to the class position individuals occupy, in terms of their social class-accessibility. In other words, aspirations (i.e. avoiding intergenerational downward mobility) are equal between children of working and service classes, but the distance to cover to fulfil those aspirations differs a lot between the two classes. The choice of a specific educational or occupational career in fact entails different

[148] Boudon (1974) was led by the lack of appropriate data and analyses to think that the puzzle to explain was that despite educational expansion *and* declining class differentials in educational attainment, rates of intergenerational mobility were constant. Boudon (1974) thought that the decline in the influence of social class on the transition probabilities (secondary effects) consequent to the dramatic expansion in educational opportunities was a general feature of modern societies. This actually has not materialized (Goldthorpe 1996, 2000).

[149] The authors develop the prospect theory in an open critique to the expected utility theory as a descriptive model of decision under risk.

opportunities and constraints[150] and thus a different perception of costs and benefits of that choice, depending on the class of origin (Goldthorpe 1996)[151]. In Goldthorpe's words "educational decision-making remains conditioned by the class situation in which it takes place" (Goldthorpe 1996: 494).

This argument makes two fundamental assumptions: first, that education is a positional good and its returns in employment depend on the relative educational qualification of an individual compared to his/her competitors in the labor market; second, as mentioned above, that the principal concern of families is that their children reach the educational qualification that is enough to preserve the socioeconomic status of their parents, or at least enough to avoid downward mobility.

The result is that children from lower classes look less ambitious than their higher-class counterparts even though they are not. An expression of this is that negative consequences of a failure in high-level educations are much larger for working class children compared to service-class children (Gambetta 1987; Goldthorpe 1996). In his seminal work on class inequalities in educational attainment in Italy, Gambetta (1987) shows that middle-class families tend to more easily ('light-heartedly') expose their children to failures in post-compulsory education, in contrast to working class families, which play it safer[152].

This latter finding recalls the concept of compensatory advantage (Boudon 1998; Bernardi 2014) of individuals from upper classes compared to the working class, in making life-course trajectories less dependent on early failures or negative outcomes. The explanation for this advantage lies exactly in the assumption of risk aversion described before: if the goal is to avoid downward mobility a negative school outcome lowers the child's future probability of success and consequently lowers the probability that he/she proceeds further in education. However, to avoid downward mobility children of the upper class would always find it optimal to continue education, independently of the probability of success, because their families have the resources (economic, social and cultural) to compensate for their eventual early failure and to make sure children maintain their advantage notwithstanding the negative school outcome. In contrast, for low-classes' children the probability of success is determinant because, first, the family has limited resources and they might devote them to pupils who performs better at school and, second, because starting from a low socioeconomic position they do not really need to proceed in education to avoid downward mobility (Bernardi 2014).

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150 The second and third mechanisms of class differences in ability and resources identified by Breen and Goldthorpe (1997, 2000) mentioned at the beginning of this section.

151 This further relates to Boudon's distinction between primary and secondary effects of class membership on educational attainment, the former regarding the class effect on achievement and the latter regarding the class effect on the choices students of different background make when faced with transitions (leaving school or not, choose between vocational and academic degrees, etc.). Boudon (1974) further argues that, while educational expansion reduced primary effects, it is when making the transitions (secondary effects) that families of different classes evaluate differently the costs and benefits (and the perceived probability of success) of the different options their children face.

152 The aim of Gambetta's (1987) study is to investigate the extent to which rational action theory can account for the class differentials in career within the Italian educational system. Gambetta shows that there is a rational planning of educational career, filtered by class-related resources constraints and success expectations. He also shows, however, that there is also a sub-rational inertia-tendency within classes: working-class families tend to underestimate their children's likelihood of success in education while middle-class families tend to overestimate their children's chances (see Gambetta 1987: 86-100).

This discussion is useful to put into context the theoretical assumption of relative risk aversion across different classes that I will adopt in the present study of fertility behavior. I will assume in fact that non-downward intergeneration mobility is a precondition for women to become mothers. However, this is not the sole theoretical link between social mobility and fertility. I review here the other mechanisms identified in the literature.

The theoretical interest in the relationship between social mobility and fertility has a long-standing record. Already at the end of the nineteenth century Arsene Dumont (1880) argued that individuals have a natural inclination to move upward in the social scale and that in the process they become less and less likely to have children[153] (Kasarda, Billy, and West 1986).

In the chapter on mobility in Boudon's (1992) book *Traité de Sociologie*, M. Cherkaoui illustrates the four main mechanisms linking social mobility and fertility suggested by the literature (Duncan 1966; Blau and Duncan 1967; Kasarda 1985, Kasarda, Billy, and West 1986). More recently, and more systematically, also Zhang (2008) makes a similar effort[154] describing those four theoretical hypotheses: social isolation, stress and disorientation, status enhancement and relative economic status.

The first 'social isolation' hypothesis argues that both upwardly and downwardly mobile individuals have a higher fertility level with respect to immobile individuals (Blau and Duncan 1967). The reason is that moving from one class to another implies entering into a new environment, with lack of support and few social ties, for which individuals tend to compensate with higher fertility, to increase their social connections. The second hypothesis of stress and disorientation starts from the same premises of weak integration and lack of support in the class of destination but predicts exactly the opposite result, namely that mobile individuals have lower fertility than non-mobile exactly because they are disoriented.

These two hypotheses are symmetric for upward and downward mobile individuals while the next two mechanisms are asymmetric such that they predict opposite fertility outcomes for upward versus downward mobile people (Blau 1967).

The status enhancement hypothesis argues that ameliorating one's own occupational status implies having fewer children than being non-mobile, while downward mobile individuals have high fertility compared to both upward mobile and immobile individuals[155]. The argument is that couples that aspire to a higher occupational and social status devote their resources to their careers and invest in the domains that allow them to maintain the higher status. The opposite is true for the downward mobile individuals, who put more resources into the family[156].

The last hypothesis is the one this chapter specifically refers to: the Easterlin Hypothesis of relative

[153] Note that this is the exact opposite mechanism of the one tested here.
[154] Among the many other effects that occupational mobility has on different political and social outcomes.
[155] This is the same mechanism that Arsene Dumont (1880) refers to.
[156] Social mobility here is defined by the aspirations and the social promotion that the individual pursues. The consequence of this theory for downward mobile individuals is not clear: on the one hand they should have a higher fertility because their subjective perception of mobility is different from the upward mobile (less or no aspirations), however, on the other hand, they might have a lower fertility compared to the immobile if they attempt to regain the lost social position (Cherkaoui 1992).

economic status. I illustrate the theory extensively in the next section but, to put it briefly, the argument is that individuals who have reached the socioeconomic position of their family of origin are more likely to feel that they can afford a family and parenthood, and thus are predicted to have higher fertility, compared to downward mobile couples who, comparing their social status to that of their parents during childhood, are less likely to feel they are in an adequate position to have children.

The relative economic status and status enhancement predict opposite results for fertility for upward and downward mobile individuals; however, they differ in their position on immobile individuals: while Easterlin assimilates the behavior of all non-downward mobile individuals (they have a higher fertility compared to the downward mobile), the status enhancement hypothesis states that immobile and upward mobile individuals behave differently, namely the latter have a lower fertility compared to the former who do not need to devote resources away from the family to maintain an higher socioeconomic status. This is an important point for the present investigation, as will be illustrated later on in this chapter.

2.1.2. The Easterlin Hypothesis

During the seventies, the American economist Richard A. Easterlin developed a comprehensive model relating business cycles to fertility behavior.

Diane J. Macunovich (1998) gives a very detailed overview of Easterlin's theory and of the streams of literature that followed his model. According to Macunovich, the theory "challenged the orthodox neoclassical economic model of fertility originally suggested by Becker (1960)" (Macunovich 1998: 54). As previously described in Chapter III of this thesis, Becker assumes that the demand for children is analogous to the demand for 'durable goods' from which parents expect a direct utility, and argues that prices and incomes only explain fertility fluctuations. Despite also taking an economic (and rational action theory) approach to fertility, Easterlin bases his model of fertility on the assumption of 'shifting preferences'; meaning that he treats preferences as endogenous to the process and not as given.

The Easterlin Model (1961; 1976) hypothesizes that changes in the age structure of populations influence fertility in the sense that relative cohort size, through its impact on labor market possibilities of young adults, and disposable income, relative to their consumption aspirations and preferences formed in the family of origin, affect fertility choices. In its initial formulation (Easterlin 1961) was applied to explain the World War II "Baby Boom", and relative cohort size was used to explain the marriage squeeze and its subsequent effect on fertility. Later on Easterlin (1976) moved from using relative cohort size to the use of relative income (age-specific family income of younger cohorts relative to older cohorts) as a measure of consumption aspiration, arguing for a negative impact of those aspirations on fertility. Subsequent interpretations (Easterlin 1987) emphasized instead economic status, and how one's own status is identified relative to the level of parental influence during the formative teen years. The central point became that individuals evaluate their own disposable socioeconomic resources relative to their aspirations or, at least, to the idea they have about acceptable standards of living. The latter are based on the resources and the socioeconomic status of their family of origin. Individual strategies and the decision-making process depend, according to Easterlin, on the comparison between the available resources and the socioeconomic conditions in which individuals grow up, namely those of the family of origin. Within this theory thus the decision to have children depends, not on the individuals' absolute socioeconomic status, but on their relative status compared to that of their parents; the more the latter comparison is satisfactory, the more children they will have[157][158].

[157] The argument is clearly linked to the assumption of social mobility theory (Boudon 1974; Breen and Goldthorpe 1997; Goldthorpe 2000) illustrated above according to which individuals, when making life choices, aim to avoid downward mobility with respect to their parents' position.

[158] The publication of Easterlin's studies (1961; 1976; 1987) gave new impulse to research on the topic of economic conditions and fertility, and many scholars subsequently extended, empirically tested and criticized the Easterlin Hypothesis. The most frequent objections are that the theory fits a macro-explanation but not micro-level ones, and that the model, as it is developed, lacks short-term predictive power (Olsen 1994).

One of the most convincing and interesting elaborations of Easterlin's theory is provided by F.C. Pampel (1993, 1995, 2001). Pampel's thesis is that the influence of cohort size and female work on demographic outcomes varies across nations and time periods largely because of different institutional environments. The author incorporates, together with the Female Labor Force Participation (FLFP) rate, a series of variables to control for institutional differences among countries. Relative cohort size is found to have a stronger effect in countries with the lowest 'collectivism' ratings (Canada and the Unites States) and particularly in the 1950s and 1960s. According to the author, the reason why relative cohort size is less determinant in collectivist institution countries (European Nordic countries) is that they do more to distribute the cost of children across generations through social programs. Pampel argues that rather than directly affecting fertility, collectivist family support reduces the impact of economic circumstances across cohorts on fertility, so that private income, employment and cohort size are less crucial.

2.2. Empirical research

The earliest study on intergenerational mobility and fertility was conducted in the US by Baltzell (1953). The author compared total family size of upwardly mobile and non-mobile individuals and found that the latter had larger families and were less likely to have an only child (Kasarda et al. 1986). Baltzell explained the difference with the financial limitation to which the upward mobile families are subject and with the smaller prevalence of family norms in the higher class of destination (Kasarda et al 1986: 11). His argument is, opposite to Easterlin's, reminiscent of Arsene Dumont (1880) idea of renouncing to children to move up on the social ladder (and the mechanism of status enhancement that was formalized later on).

During the sixties Tien (1965) also studied the effects of intergenerational mobility on fertility among full-time professors in two Australian universities in 1957. Contrary to Baltzell (1953) the author did not find any complete fertility differences between the non-mobile and the upward mobile. He did find, however, an effect on the spacing between marriage and first birth: controlling for age at marriage, upward mobile men tend to wait longer after marriage to become fathers. Moreover, wives in the mobile households worked before and after marriage while none of the non-mobile wives did, this being, according to the author, a strong intervening variable in explaining the delay in childbearing.

Depending on the methods, the operationalization of social mobility and the samples used, the early literature on mobility and fertility found very different results (Dalla Zuanna 2007; Zhang 2008; Kasarda et al. 1986). The great majority of studies found no effect, a few found a negative effect of upward mobility supporting the status enhancement hypothesis, and some found that total fertility of upward mobile individuals lies between that of the class of origin and that of the class of destination, thus being higher compared to the non-mobile individuals and supporting the social isolation hypothesis (for a detailed illustration see Kasarda et al 1986).

The great majority of relevant research (Blau and Duncan 1967; Boyd 1971, 1973; Bean and Swicegood 1979; Stevens 1981) has confirmed a significant effect on fertility of both the status of origin and of destination, but no effect of the mobility itself.

The intuition (Duncan 1966) is that there are three separate effects on fertility: the levels of fertility in the class (or occupational status) of origin, those of the class of destination, and a third and different effect on fertility of mobility on its own[159]. Blau and Duncan (1967) explained the intermediate fertility result of mobile individuals between the origin and destination class, via the reference group theory.[160] They argue that mobile individuals are not fully integrated in neither of the two groups, but

[159] The additive model includes the first two but not the mobility effect per se, which is given by the interaction model (Blau and Duncan 1967).
[160] Later on named the "Acculturation Hypothesis"; see Kasarda et al. 1986 for details.

that both groups exert some influence over those individuals, therefore they are expected to behave in an intermediate way (Blau 1956: 291).

The latter result is confirmed by Zimmer (1979) who conducted a study in Scotland using various measures of mobility (e.g. different combinations of father/children occupational outcomes at different time points) and of fertility (e.g. number of pregnancies, spacing). The author found that regardless of the measures used, upwardly mobile women's fertility is lower than non-mobile in the original status and of downward mobile women, while on the contrary, those downwardly mobile have a consistently higher fertility compared to non-mobile at the origin and to upward mobile women.

More recent research on the topic is rare as the richness of studies and theoretical developments of the seventies and eighties did not drive substantial empirical results (Zhang 2008). In the past decades scholars have left aside the topic by concluding that social mobility does not affect fertility (Zhang 2008).

Empirical research following the publication of Easterlin's study on the relationship between economic resources, aspirations and fertility is rich but the evidence is mixed and, as suggested by Pampel (1993, 1995, 2001), quite country-specific.

Aggregate cross-country analyses, generally investigating the impact of relative cohort size and fertility rate, find support for the Easterlin Hypothesis especially in Anglo-Saxon countries, while they find little or no support in Germany and southern European countries.

Evidence from individual-country macro-studies is controversial, and studies do not always back the original model because, for example, most of these studies use period income measures instead of age-specific variables of relative income. The measure to compare relative economic status in fact should be, according to Easterlin, the relative market position (in terms of earning, employment status, etc.) of the young adult versus the market position of his family of origin at the time of the formation of his consumption aspirations, namely his adolescence. Moreover, many studies do not add control variables, and they use family income and male earnings indiscriminately.[161]

Similarly, micro-model applications of the Easterlin Hypothesis have been extremely various in their interpretation of the relative income measure, yielding very different results. According to Macunovich (1998) fifteen micro-studies in the US supported Easterlin's thesis, while seven were did not. Among the latter, however, five relied on survey-based self-assessed objective and subjective measures of relative economic status, which clearly do not mirror the original hypothesis. The other two studies - Olneck and Wolf (1978) and Thornton (1980) - obtained mixed results. Thornton (1980) used the husband's annual income relative to the parental head's annual income or to the parental welfare indicator, but without clarifying whose parental head (wife or husband) was employed. Olneck

[161] Macunivich (1998) further wrote that "a central mechanism in the Easterlin hypothesis is imperfect substitutability between older and younger workers, which leads to a widening of the gap between the earning potential of older and younger workers at a given point in time, or at points very close in time, rather than at a given age". Period income measures (comparing different points in time of young adults' average income or unemployment or GDP time series, as often done in these macro studies) do not tell us anything about the intergenerational comparison in a given period, which is the focal point within Easterlin's theory.

and Wolf (1978) used a sample of brothers to investigate whether differences in sibling earnings were correlated with sibling differences in number of children, assuming that parental influence was the same for each sibling. However, the study was conducted without taking into consideration other non-parental differences between brothers. Neither study found that relative economic resources are correlated to higher fertility.

Among supportive micro-analyses, measures of relative economic status also vary a lot: eight out of fifteen used the measure of relative economic status as defined by Easterlin, namely a husband's actual income relative to the parental income (or relative occupational status) while the other seven used husband's actual income relative to some measures of 'predicted' income based on characteristics like age, age at marriage, education, place of birth and occupation[162].

A more recent example of how social mobility affects fertility is carried out by Zang (2008) in his PhD dissertation at the University of Chicago. The author in particular analyzes the impact on men's completed fertility of intergenerational mobility (using occupational prestige) in the US in the period 1974-2004. Focusing on mobility *per se*, Zang does not distinguish between upward and downward mobility and finds that mobility depresses completed fertility thus supporting the stress and disorientation hypothesis.

Another recent but very different example of an analysis of social mobility effects on fertility is done by Bernardi (2007) who studied the effect of social mobility on the transition to first birth for Italian men[163]. Following the Easterlin's hypothesis, Bernardi (2007) explains the transition to the first child by the comparison between available resources and socioeconomic aspirations regarding an acceptable standard of living. The study focuses on men and the two variables are operationalized as the individual's occupational prestige over his father's occupational prestige when he was 14 years old.

The interesting implication of this model explicitly expressed in Bernardi's paper is that the higher the socioeconomic level of the family in which an individual grew up – in other words, the luckier he was during childhood – the higher his minimum income aspirations will be on entering adulthood and consequently the more difficult will be to realize those aspirations. The theory predicts that those discouraged individuals will restrain from long lasting commitment, for instance postponing or renouncing to marriage and childbearing.

Bernardi (2007) finds support for the Easterlin hypothesis (and also an increasing relevance over time) of the relationship between resources and aspirations on family formation in the Italian context: the socioeconomic condition of the family of origin is seen as sort of threshold to reach before having a

162 As importantly pointed out by Macunovich (1998), many of the studies that used the 'correct' measure of relative income suffered instead of a technical drawback: they used a categorical variable instead of a continuous variable of relative income, assuming that income aspirations of actual households are equal to the economic status of the family of origin, and not, more generally, a function of parental income. However, solving this limitation could only improve the results in favor of Easterlin's model, being this assumption implicitly made by categorical variable, even more restrictive than the original one. For a detailed description of these studies see Macunovich (1998).

163 Together with the Easterlin's theory and the social mobility theory - described in section 2.1 of this chapter - according to which there is a minimum objective in social mobility strategies, that is avoiding downward mobility with respect to one's own parents; Bernardi (2007) also refers the Oppenheimer's (1988; 1997) theory of risk aversion (or uncertainty or immaturity theory) - cited in the introduction to this chapter - according to which uncertain conditions in one dimension of the life course are mirrored in other domains, having a negative impact on the propensity to commit to long lasting obligations, among which the formation of a family and parenthood.

child. The probability of fatherhood actually increases around 10% if the individual is non-downward mobile with respect to his parents. However, being in search of the first job is by far the most relevant factor in reducing the chances of entry into parenthood but, as Bernardi concludes, in a country like Italy where social mobility is extremely low, the time spent in search of the first occupation is already a signal that the resources relative to aspiration mechanism is at play. Knowing that social mobility during the career is rare, young adults in Italy wait longer to enter into the labor market until they get a job that is already in an occupational position very close to that of their aspirations (assumed to be a function of the parental socioeconomic status). The longer they wait to accept their first occupation, the higher their aspirations are, and the lower is the likelihood of setting up a family.

This might not be only an Italian feature since it has been shown also for the UK, by Aassve et al. (2004): the higher the parental socioeconomic status the slower is the entrance into the labor market, even controlling for education (Aassve et al. 2004: 10).

In sum, empirical research regarding the effects for fertility of both the social mobility and the Easterlin hypotheses has been modest especially in the last two decades, probably in light of the fact that early studies concerning both hypotheses received highly controversial support. Despite the large theoretical development of the topic, empirical research is little, very diverse and studies are not often comparable. All in all there is no indication from the literature about which mechanism linking social mobility and fertility among the four described in the previous section should prevail, or under which empirical conditions (e.g. the different institutional context).

There are few positive indications of the existence of an effect but the direction and the magnitude is far from having been clearly identified by scholars. Older studies carried out around the time when the theories were developed seems to support the idea that mobility per se has no effect on fertility and, if anything, that intergenerational upward mobility negatively affects the likelihood of childbearing (supporting the status-enhancement mechanism). In contrast, more recent studies such as Bernardi (2007) find evidence that individuals do compare resources and aspirations formed in the family of origin and that upward occupational mobility with respect to the family of origin increases the likelihood for parenthood. However, in a very different setting and looking only at symmetric mobility Zang (2008) finds that mobility (of any kind) depresses complete fertility.

The present chapter investigates the nexus between resources and aspirations, and fertility during a period of high economic and employment uncertainty that depresses the chances of the children to reach the socioeconomic position of their parents. In particular, I focus on testing the asymmetric mechanism of relative economic status (Easterlin)[164].

[164] Notice though that here I do not specifically address the issue of mobility *per se* because I only concentrate on non-downward mobility, thus assimilating the categories of immobile and upward mobile, as done by Easterlin. The two mechanisms of relative economic status and status enhancement differ exactly on this: while Easterlin argues that immobile and upward mobile behave in the same way, the status enhancement hypothesis states that upward mobile individuals have a smaller fertility compared to downward *and* immobile individuals. In this sense when I refer to the status enhancement mechanism I am – slightly incorrectly – referring to both immobile and upward mobile women having a smaller hazard of first birth compared to downward mobile women.

3. The data and the statistical model

The dataset used in this analysis is again the Panel Survey of Income Dynamics (PSID), described in the previous chapter (see Section 4 of Chapter III). Notwithstanding the already-noted complexity of the survey, this dataset is particularly useful in the case of this chapter because it traces in detail the occupational trajectories of individuals, up to the last four jobs they had since the last interview, two years before, with information on type of occupation, and the start and end date of each job[165]. In this way, the effect on fertility of both the kind of occupation and the time and duration of each job can be estimated. The consequences of employment and occupational mobility for childbearing do not depend only on the mere manifestation of these events but also on their timing and their duration. Moreover the effect that they have on births might relate also to the timing of childbearing and not only to the fact of having or not having a baby (Meron and Widmar 2002). These factors are not efficiently specified and completely exploited in the panel fixed effect model of the probability of first birth - in spite of its greater simplicity and ease of interpretation - that was used in the analysis of Chapter III. Therefore, in this chapter, the model is estimated using Event History Analysis (EHA) with time-dependent variables[166]. The EHA biographical approach makes it possible in fact to analyze individual histories more precisely and to more accurately model the transition to parenthood (Meron and Widmer 2002).

The analysis thus focuses on 15-45 year-old American women[167] followed, as before, in the last five waves of the panel (2003-2011)[168]. Beyond the statistical model of estimation and the focus of the explanatory variables on social mobility, a third novelty of this chapter with respect to the previous one is that I abandon the couple-perspective adopted in Chapter III, to include in the analysis also non-partnered women[169]. This allows me to compare the estimates on partnered women to the findings of the previous chapter but also to differentiate the impact of economic conditions on first births inside and outside of 'formal' partnering. In fact, the results on single women can be interpreted as the hazard of premarital or out-of-wedlock fertility.

Although these crucial differences will have a strong impact on the estimates, which I expect to be quite different from those in the previous chapter, I try as much as possible to keep the models similar

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165 Moreover, as was the case in the previous chapter, for each individual the survey reports the US state of residence at the time of the interview, so that individual-level information can be linked to local state macroeconomic conditions.

166 Also in light of the life course approach described in the previous chapter, the natural methodology to describe life course events, transitions and trajectories is EHA.

167 Both black and White women included, but no immigrants. The distribution of the race of the head of the families in the PSID, in individual data, between 2001 and 2011, went from 33% Black, 67% Non-Black in 2001, to 36.65% Black, 63.35% Non-Black in 2011 (Technical Report, 2013).

168 The initial dataset was composed by 154.665 person-family years observations (30933 person-family in each of the 5 waves). From this dataset 17823 observations were cut because these women were mover-out non-response or mover-out that entered again on subsequent waves. From the 117755 person-family year observations left, only women that were Heads, Wives or Cohabiters, were selected so that they constitute an independent family. Finally, from those, I selected women without children at the time of the first interview, being left with a panel of 2811 women in the age range of 16-45, with their first child born between 04/2003 and 12/2011, and 8128 person-years observations.

169 As the model was already quite complex and the dataset not too big, I preferred to simplify and not to include partners' characteristics.

with respect to the analyses in the previous chapter, so that estimates can be somehow comparable. Beyond the sample and the time period that are the same, for instance, I keep the same macro-level indicators (unemployment and period effect), the controls[170] and, as before, I include a state fixed effect.

The Cox Proportional Hazard Model is used to study the hazard of having the first child for those women across the Great Recession years. The Cox model belongs to the family of the proportional hazard models and it has the advantage of being very flexible, imposing no assumption on the time function. The only assumption implied by the Cox model is that units' characteristics affect the hazard of first birth proportionally.

Those women in the PSID data are observed from age 17 until they either have their first child or they exit the survey. In studies of fertility in developed countries, the time at which women become at risk of motherhood is conventionally set at the beginning of reproductive age, the 15th birthday. However, for two reasons in the present analysis the origin is set to the time when each woman turns 17. First, teenage pregnancies are rare in the sample and measurement errors are large; second, the focus of the analysis is on intentional births and their nexus to occupational mobility, while pregnancies during adolescence are usually unintended and not linked to employment itself or socioeconomic mobility.

The failure event is set to 12 months before the birth of the first child and not to 9 months before (conception date), as usually done, so as to capture the moment around the time when the decision to have the child takes place. I assume the decision to become mothers is reasoned and that sometimes some attempts are necessary before becoming pregnant.

Setting the failure event 12 months before the actual birth allows for measuring the explanatory variables at the time of the event (they are not lagged).

Another important issue is that women do not enter the study all at the same time: some women are present since the first wave in 2003 while others enter later on. Moreover women do not enter all at the same age: some women are observed since they become at risk, but others enter into the study much later, after having been at risk for a while. These spells that come under observation after exposure are left-truncated[171] and they create a problem of sample selection: women that enter the study later in life are women that reached that age without having children and are less likely to have children in general. This means that if we treat them like all the others we will over-represent low-risk cases. Since older cohorts are more and more over-represented by women with a larger survival time, if we do not take into account this bias we will underestimate the hazard rate of first birth.

[170] Though I could include in the EHA time invariant controls that I could not include in the FE model such as race and number of siblings.

[171] Left-truncation is different from left-censoring: the latter arises in fact when the event of interest happens before or after the observation window, so that the investigator cannot observe the event but he/she knows that it has happened before (it can only appear for repeated events, i.e. if we were studying births in general) while with truncation there is no observation of the events before the period of study because women with children are automatically excluded from the sample.

One potential solution cited in the literature (mostly from epidemiology) would be to collect information on the excluded sample (Cain 2011) but this seems unfeasible in my case.

An alternative solution to control for the selection bias is, when the actual start time of exposure of each woman to the study is available, to correct the likelihood function by conditioning the hazard[172] on the length of exposure to risk of each woman (Allison 1984, 2010; Guo 1993).[173][174] In other words, in the likelihood function each observation is weighted by a function of the delayed entry into the survey (a sort of inverse probability of being sampled and interviewed). In practice this is done in Stata, when setting the data, by specifying the entry date. This method gives unbiased estimates of the hazard of the event[175], however, they can be quite imprecise if the lowest age at entry under observation in the survey (15 years old here) happens shortly before the earliest possible manifestation of the event (the origin is set at age 17 here) because the risk-set of observations between the two ages is small (Cain 2011)[176]. This is, admittedly, probably the case here because I have only 5 women aged 17 who did not give birth and I have already at 18 years old the first births. This is a caveat of the analysis that needs to be taken into consideration in interpreting the results.

As mentioned, the statistical model tests whether women's transition (hazard rate) to first birth is affected by intergenerational occupational mobility during the Great Recession. The pillar hypotheses of the analysis to test are two: the Easterlin Hypothesis of relative (intergenerational) socioeconomic status and the cross-level interaction of individual social mobility status with indicators of the economic and financial crisis.

Intergeneration mobility has been operationalized very differently in the literature. In a recent review, Torche (2015) describes it as the "extent and pattern of association between parents' and adult children's socioeconomic standing, where higher association means less mobility" (Torche 2015: 37-38). The most common measures of mobility are social class, occupation, earnings or income, and education, depending on the discipline that studies mobility pattern: for instance, sociologists tend to prefer occupational or educational measures while economists tend to prefer earnings and income.

Occupational status is a weighted average of the mean level of earnings and education linked to each occupation. Its advantages, compared to earnings and income, are the ease of collection and recall, the

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172 "Let T_i be a continuous variable representing the *duration time* that a subject of interest has been exposed to the risk of an event; t_i be the *observed duration* that a subject of interest has been exposed to the risk of an event; and u_i be the duration time that a subject of interest has been exposed to the risk of an event *at the sample selection time*. To be eligible for a prospective study [...], we require that subjects are at risk of exposure to the event at the time of selection and thus we have $t_i \geq u_i$ and $u_i > 0$. For a subject which has been exposed to the risk and is currently eligible for the study, its duration time T_i is left truncated at the sample selection time u_i. Whereas the original hazard function is $Pr(T_i = t_i \mid T_i > t_i)$ where $t_i > 0$, the hazard function for a left-truncated Ti is $Pr(T_i = t_i \mid T_i > t_i, T_i \geq u_i) = Pr(T_i = t_i \mid T_i > t_i)$ where $t_i \geq u_i$." (Yang and Aldrich 2012: 482)

173 The entry point, when observation begins, was set at 24 months before the first interview in which the woman entered into the panel, because the dataset gives retrospective information on the job history of the last two years before the interview. In this way the complete history of each woman is precisely observed, independent of when she enters the study.

174 After setting the data, episodes are split according to our time-dependent covariate: entry and exit into the labor force, or occupational changes. Finally, since the aim of the study is to analyze the interaction between the individual job-market position and the aggregate conditions of the labor market, I further expanded the dataset, splitting episodes every 6 months and merged the dataset, based on calendar dates and the US state of residence of the woman, with the State Monthly Unemployment Rates (Federal Reserve Bank of St. Louis data).

175 The procedure gives an unbiased estimate of the hazard of the event only if the lowest age at entrance to the study is smaller than the earliest possible age at which the event can happen (Cain 2011). In the present case the lowest age at entrance to the study is 15 years old (24 months before turning 17, see footnote #173) and the earliest possible event (first birth), the origin, is set at 17 years old; thus, the estimates are unbiased.

176 To my knowledge at the time of writing the only reference to this problem is made in the epidemiology literature (see Cain 2011). I did not find any study in the disciplines of sociology, demography or economics referring to this issue.

smaller extent of refusal in communicating it, and its reliability and stability over time (Hauser and Warren 1997). Moreover, children can easily report information on parents' occupation retrospectively. Occupational status correlates highly to other social and economic measures but it is usually more stable over time compared to them, providing a more accurate measure of life-long standing than average earnings or one-year income. The limitations of occupational status concern mainly gender specificities of education and earnings occupational paths (Torche 2015). Hauser and Warren (1997) also showed that education rather than earnings constitutes the main effect of the intergenerational association of occupational status over time[177].

In this analysis social mobility at time *t* is measured through the Socioeconomic Index (SEI) linked to the woman's occupational trajectory and the average index of the parents' occupation when she was growing up[178]. The variable is calculated based on the Occupation classification of Census 2000 (3-digit occupation code)[179]. First, I linked to every occupation episode its absolute SEI, following Hauser and Warren (1997)[180] and the updated indexes provided by Frederick, C., 2010[181]. Second, I calculated the average SEI of the woman's parents and then took the ratio between the woman's SEI and the average of her parent's SEI, for each occupation episode reported in the survey.
The absolute SEI varies in the sample in the range 8.84-80.5, with a mean of 40.9 and the average parents' SEI is slightly lower, with an average of 37.4 (range 7.55-80.5). The relative SEI ranges between 0.21 and 6.22, with a mean of 1.17 (see descriptive statistics and Table A3.1-A3.3 in Appendix 3). The variable is then recoded as categorical: 1 if the relative SEI is smaller than 1, when the woman's occupational episode is of intergenerational downward mobility, 2 if the relative SEI is greater or equal to 1, implying an immobile or an upward mobile occupation for the woman in that episode.
Using the relative SEI as a categorical variable is quite a restrictive assumption, because socioeconomic aspirations of women are set equal to the socioeconomic conditions of the family of origin, and not in general as a function of parental economic conditions (Macunovich 1998). Finding a result with this variable specification therefore means finding a lower bound of the effect of relative resources on first birth. The reason for choosing the categorical specification is that results are more straightforward to interpret in an already complex interaction model.

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177 While absolute mobility is measured as the change in average occupational status over time, and in the US it has been relatively stable in the cohorts born in the second half of the twentieth century (Hauser et al. 2000), relative mobility is slightly more complex. It is measured by the coefficient of parental occupational status in a regression of the status of the child. Intergenerational mobility operationalized in this way for White men in the US has varied in the last decades between 0.3 and 0.45, while it is much weaker for African American men (Torche 2015). There is some weak evidence of occupational status intergenerational mobility increase between the 60s and the 80s, but formal tests are usually lacking (Torche 2015: 39).

178 The question posed to the Head in the survey, for both the Head's and Wife's father was the following: "*What was (your/her) father's usual occupation when (you/she) (were/was) growing up? What kind of work did he do*?" The same question was posed regarding the mother's occupation. In case one of the two was missing I used the available one.

179 Census of Population and Housing: Alphabetical Index of Industries and Occupations issued by the U.S. Department of Commerce and the Bureau of the Census was used for this variable. Please refer to www.census.gov/hhes/www/ioindex/ioindex.html for complete listings.

180 Hauser and Warren (1997) use techniques similar to Duncan (1961) using national data from the 1990 Census 5 percent public use sample. The H&W1997 Index goes from 7.55 in Production Occupations to 80.5 for Physicians and Surgeons. Theoretically then the relative (to the parents' average) socioeconomic index of women in the sample could range from 0.094 (min\max) to 10.66 (max\min).

181 The original H&W Index is based on the occupational classification system of 1990; the Census Bureau updated the system in 2000, and this is the classification used in the PSID. Frederick's working paper explains the calculations to update occupational status indexes and makes available the updated H&W index at http://www.ssc.wisc.edu/cde/cdewp/OccCodes.zip.

In addition, to make the estimates comparable with those of Chapter III, the variable is operationalized to include also women that do not work. I use employment status (1 if she is employed in that episode, 0 if she is out of the labor force or unemployed) to construct the final explanatory variable of activity status: the combination of employment status and intergenerational mobility. Activity status is equal to 0 in episodes of non-employment, equal to 1 if the woman is in a downwardly mobile job and equal to 2 if she is in an immobile or upwardly mobile job (with respect to her parents' average job).

A crucial drawback of this analysis is that in the dataset it was not possible to separate the categories of unemployed and non-employed, because unemployment spells other than the ones coinciding with the interview had to be constructed based on the occupational trajectories reported. However, having no other information signaling what the woman was really doing in between jobs, it would have been too risky to assume that they were unemployed instead of being out of the labor force, or vice versa. This is an important problem, but, due to data limitations, it is common to many studies on female employment (Matysiak and Vignoli 2008, 2013; Kreyenfeld and Andersson 2014). This further implies that not all the results of this analysis can be compared to those of the previous chapter, where it was possible to make this distinction.

The model is represented in equation (1) where the hazard of having the first child at time *t* depends on the individual activity status, the aggregate effect of the recession and the interaction of the two at time *t-1* (to avoid issues of reverse causation).

$$HR\ FirstChild_{\,i,t} = \beta Activity\ Status_{i,t-1} + \gamma CRISIS_{t-1} + \delta Activity\ Status_{i,t-1} * CRISIS_{t-1} + \theta X_{t-1} + \varepsilon_{i,t-1}$$

$$Activity\ Status_{i,t} = \begin{cases} Downward\ Mobile & if\ Employed = 1\,;\ \dfrac{Occupational\ SEI\ Status_{i,t}}{Parents\ Avg\ Occupational\ SEI\ Status_i} < 1 \\ Out\ of\ labor\ force & if\ Employed = 0\,;\ \dfrac{Occupational\ SEI\ Status_{i,t}}{Parents\ Avg\ Occupational\ SEI\ Status_i} = 0 \\ Immobile\ or\ Upward\ Mobile & if\ Employed = 1\,;\ \dfrac{Occupational\ SEI\ Status_{i,t}}{Parents\ Avg\ Occupational\ SEI\ Status_i} \geq 1 \end{cases} \tag{1}$$

The recession is operationalized in two ways: first, with a period variable capturing, theoretically, the total effect of the Great Recession. This is the categorical variable CRISIS in equation (1) which takes value 1 for episodes (starting and ending) before Dec. 2007 (excluded); value 2 between Dec. 2007 and June 2009, plus episodes starting before and finishing during the recession (963 episodes starting between Sept. 2007 and Jan. 2008 and finishing between Feb. and March 2008) and finally, it takes value 3 for episodes starting after June 2009.

The second way the recession is measured – as was done as well in Chapter III – is through the monthly unemployment rate of the state of residence of the woman at the time of the interview, which should proxy the pace of the recession and the labor-market effects of the crisis. Since unemployment data cover a 10-year period (Jan 2001-Dec 2011) and 56 US states, women in the sample are exposed to different degrees of severity of the recession across time and location. This variance in employment conditions and economic uncertainty can be exploited in the analysis to grasp the effect of being exposed to this different scale of economic downsizing, beyond individual economic and working conditions. Unemployment ranges from 2.4 in Utah in January 2007 and 14.2 in Michigan in August 2009. As mentioned, I also control for state differences, other than unemployment, with state dummies.

The first control variable in the vector X in equation (1) is race, distinguishing between White non-Hispanic women, Black and women of other ethnicity. The second control is cohort, a categorical variable that differentiates between women born before Dec. 1973 (roughly around 28-30 years of age at the beginning of the survey), between Jan. 1974 and Dec. 1980 (around age 20-25 at the beginning of the survey) and women born after Jan. 1981 (younger than age 20 at the beginning of the survey).

I also include the number of siblings as a proxy for preferences for children, since coming from a large family is usually associated with a higher desire of having children[182].

Another control is years of completed education, which is included linearly in the analysis and goes from 6 years (primary school) to 17, which corresponds to having done at least part of a master's degree (see summary statistics in Table A3.3 in Appendix 3). More than one quarter of the women in the sample completed high school (27%) and the percentage is almost the same in all the three cohorts, while around 16% were in vocational training at some point in time. Larger differences across cohorts in education arise at higher levels of education: less than 20% of the older cohort held a bachelor's degree and slightly more than an additional 10% held some master's degree. As expected, the younger cohort (especially because many of these women are still in school or might go back more easily) is more educated, with almost 26% of the young women holding a bachelor's degree and an additional 10% holding a master's.

The last control is marital status: a categorical variable ranging from 0 to 2 (0 being unmarried, 1 being married and 2 being divorced or separated)[183].

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182 An additional remark: all covariates change over time, but since the date of the variation is not reported the only information we have is that the change happened between those two waves. What was done during the episode splitting was to assume that the change happened in the last episodes before the last wave, since Stata automatically organized it in this way during the splitting and we had no other insights to assume differently. This is a drawback of the analysis since we are imputing a change in a variable in a point in time that might not be the correct one. While this might be of smaller relevance for the controls, it is a main issue regarding the principal explanatory variable, the unemployment rate, for two reasons: first, since we are directly interested in the effect of the monthly unemployment level at the time of first birth, if the variable is misreported in the crucial period because the woman actually moved at a different point in time, this would yield wrong estimates. Secondly, and more importantly, there might be an issue of endogeneity since, mobility is quite high in the US, and especially during downsides of the business cycle people move, looking for better opportunities in places where the economy is doing better. We cannot be sure therefore that there is no endogeneity with regard to this, since women might move to a state where the unemployment rate is lower to find a better job, and this in turn might affect her likelihood of becoming a mother. Moreover women that migrate to another state might be selected in some way and might be different from the women who do not move. In the sample there are 247 women moving once, 41 moving twice, and 7 moving more than twice: altogether they are 12% of the sample. In an attempt to control for this, I include the state dummies as was done in Chapter II.

183 This variable is to be interpreted with some caution since it has been derived from a different variable, namely the Change in Marital Status of the Head of the family. I attributed to the wife the same marital status of the Head, when the woman is not the head of the house (which can be plausible)

Finally, before moving to the results it is worthwhile mentioning that both education and marital status might actually mediate the effect of the crisis on fertility. On the one hand, recessions might influence negatively the propensity to marry, first, because marriages are costly and couples might want to reduce expenditures during periods of economic uncertainty, and second, because financial strains might generate stress and tensions within the couple that might induce them to decide to postpone the marriage. On the other hand, married couples might enjoy some economies of scale and a more favorable taxation scheme, which might induce couples to accelerate marriages during recessions (Morgan et al 2011). In both cases childbearing would be affected by the crisis via the lower or higher number of marriages.

Nevertheless, empirical research does not support either of the hypotheses: aggregate trends suggest only moderate changes in marriage and cohabitation in the last years (Morgan et al. 2011; Cherlin et al. 2013) that are more likely attributable to long-term trends rather than to the Great Recession[184]. Marriage rates have been declining since the 1980s and they continued to decline at the same pace during the crisis, in 2007-2010 (US National Center for Health Statistics, CDC NCHS, 2012 and Cherlin 2013)[185].

Education could also be mediating the effect of the economic crisis on childbearing negatively, on the one hand, if young adults were postponing their exit from (or returning to) the educational system because of the harsh conditions of the labor market after the onset of the recession (the opportunity cost of education declines when unemployment rates are high), and if this longer permanence into education in turn were to create a delay in parenthood (due to an enrollment or an attainment effect[186]). On the other hand, education in the US is extremely expensive and individuals might find it even harder to afford it during economic downturns, or might not want to take the risk of incurring debt to pay for more years of education. The evidence on the effect of the Great Recession on educational attainment is scarce but more in favor of the first hypothesis of a positive correlation between high (youth) unemployment and post-compulsory education (Clark 2011; Bell and Blanchflower 2011).

Even though I do not directly test these hypotheses in the thesis I think it is important to acknowledge the existence of these mediating mechanisms and to keep these facts in the back of our mind while interpreting the results of the analysis.

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and I put together in the same category of married the woman who remained married in one wave with respect to the wave before, and those women who married between waves, since I do not have the date of the marriage.

184 Morgan and colleagues (2011) did not find any effect across educational or ethnic groups in the US.

185 The issue of mediation of marital status was also mentioned in Chapter II but since there I was analyzing only partnered women the mediation issue was less critical and confined to the difference between cohabiting and being married.

186 Whether the effect on birth transition is due to educational level or on educational enrollment is still debated in the literature (Blossfeld and Huinink 1991; Blossfeld and Rohwer 1995; Blossfeld and Timm 2003; Bhrolcháin and Beaujouan 2012)).

4. Descriptive Results

Figure 4.1[187] illustrates the Kaplan-Meier estimates of the survival functions to first births[188] for women born in three different cohorts: the old (continuous line) in which women are born on or before December 1973, the middle cohort (dashed line) in which women are born in 1974-1980 and the young cohort (dotted line) in which women are born on or after January 1981 (shaded areas are 95% confidence intervals). Women in the old cohort enter into the study when they are at least 28-30 years old, and their survival time is much higher than in the other two cohorts: 50% of women born before 1974 survive without deciding to have a child until around 250 months after turning 17. In other words, half of the women in the older cohorts are still childless at age 37-38 while 50% in the youngest cohort have kids by 21 and 50% have kids by age 29 in the middle cohort.

The reason is, as already pointed out, that the two older groups are selected women who entered the survey childless at older ages. The oldest cohort is comprised of women who entered at age 30 without children, while the women in the middle cohort entered the sample childless at age 23.

Figure 4.2 shows the Kaplan-Meier estimates of the survival functions to (the year before) first births for women of different ethnicities: White non-Hispanic, African American and other races combined. African American women tend to have a smaller survival time to first birth compared to White Caucasian women around the origin date, seventeen years old, but a larger survival at older ages. This is in line with the evidence on the larger number of teenage pregnancies among Black women compared to those in other ethnicities, and the lower mean age at childbirth (21 years old for Black women, CDC 2012). However, excluding teenage pregnancies, the survival functions are actually pretty similar across ethnicities, and confidence intervals (not shown) are quite large and overlapping.

Figure 4.3 illustrates instead the distribution of the individual level explanatory variable Activity Status described before, combining the employment and mobility status of women in the sample, across periods around the Great Recession. In all three periods, before, during and after the recession in the majority of episodes – in more than 40% of them - women are employed and immobile or upward mobile with respect to their parents. Nonetheless comparing the years prior to December 2007 with the post-recession years after June 2009, the percentage of immobile and upwardly mobile episodes declines by roughly 2%, while the proportion of non-employment episodes increases by more than 5%, from less than 20% to more than 25%. Downwardly mobile episodes also decline more than 3.5%.

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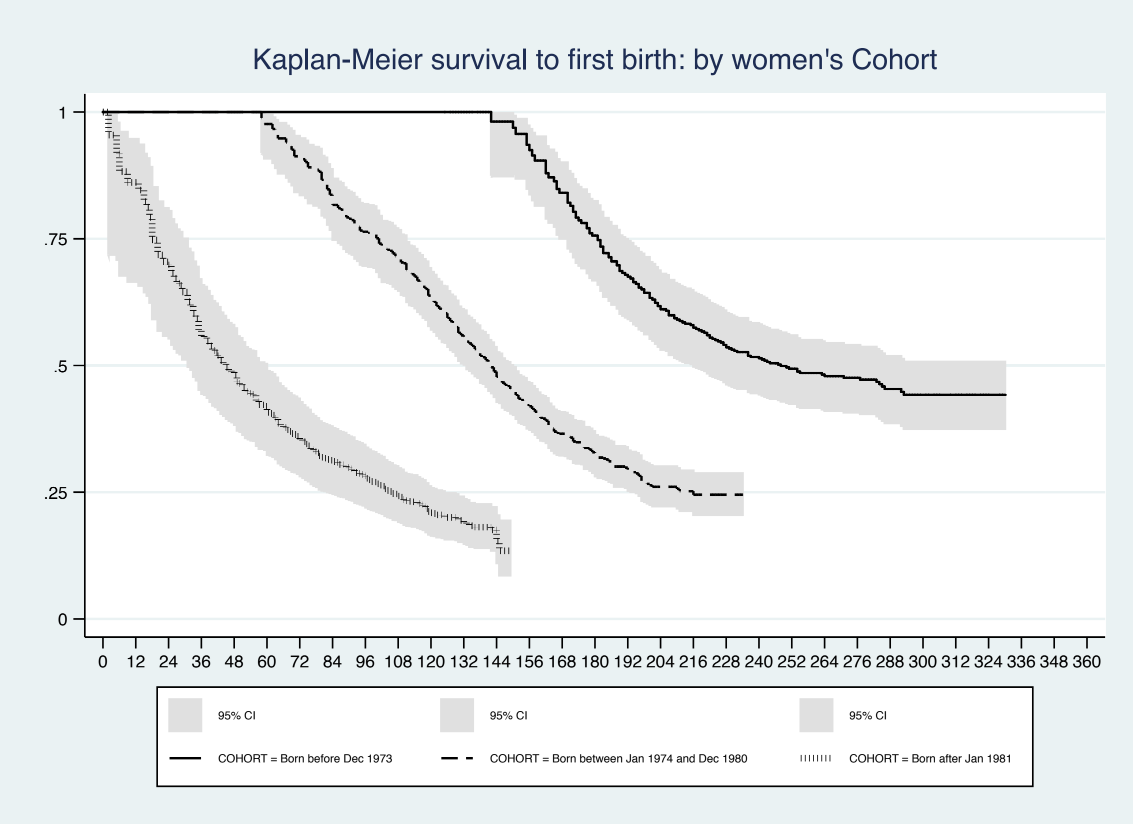
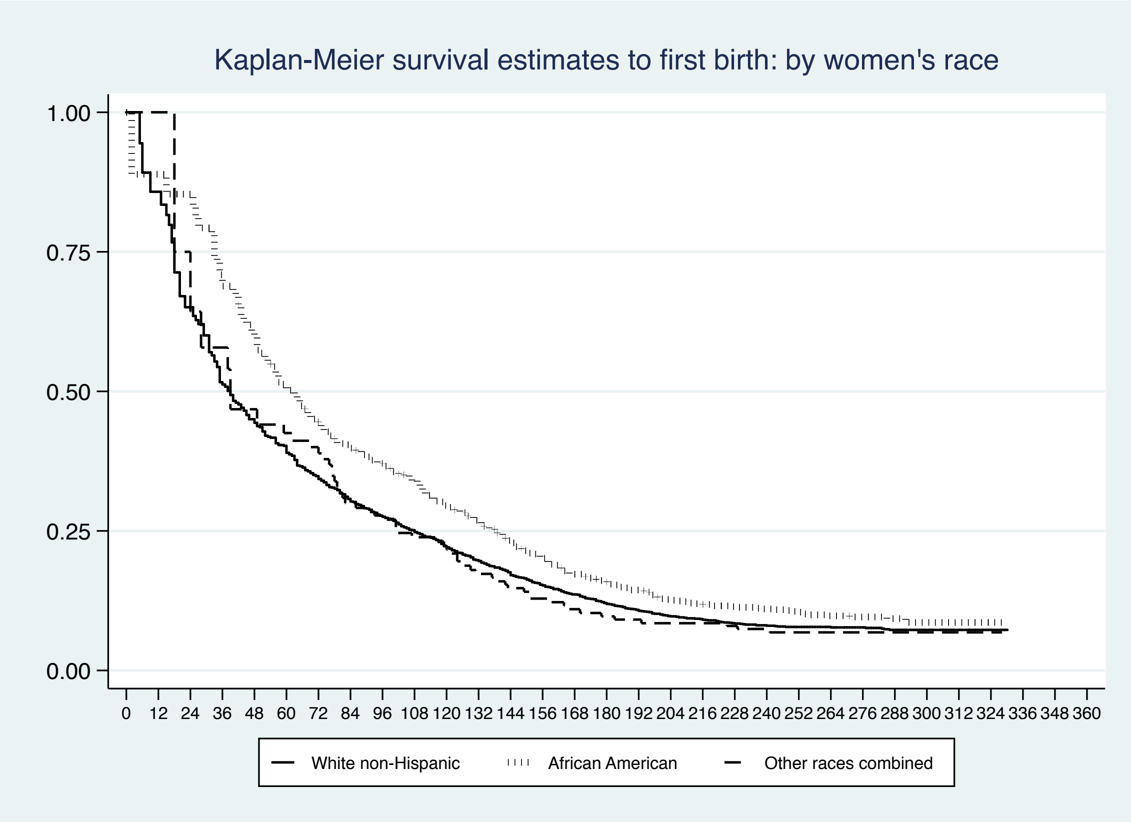
[187] Figure A3.1 in Appendix 3 reports the general Kaplan-Meier survival function.
[188] Note that the event is set to 12 months before first birth.

Figure 4.1: Kaplan-Meier survival function by women's cohort.



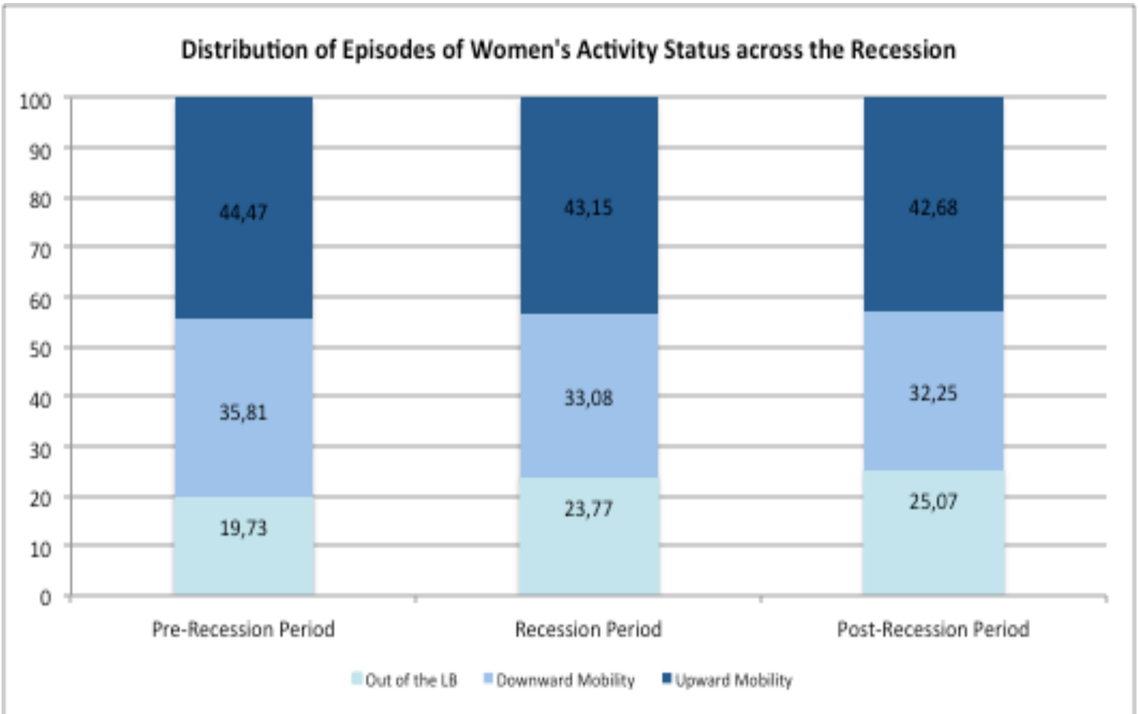
Source: Elaboration of the author based on PSID survey.

Figure 4.2: Kaplan-Meier survival function by women's race.



Source: Elaboration of the author based on PSID survey.

Figure 4.3: Distribution of women's activity status across periods.



Source: Elaboration of the author based on PSID survey.

5. Multivariate EHA Results

The results of the Cox Proportional Hazard model of first birth are reported in Tables 4.1-4.3 below. Table 4.1 shows the odds ratios of the transition to motherhood using the crisis period indicator together with individual activity status explanatory variable, while Table 4.2 reports similar estimates but using instead states' aggregate unemployment rates (as in Chapter III). Finally, Table 4.3 puts together the two crisis macro-indicators, time periods and unemployment rates, with individual-level variables.

The first result is that at the aggregate level there is a substantial negative period effect of the Great Recession on first births (net of state fixed effect): the odds ratios of having the first child are around 30% less during the period of the crisis, regardless of the model specification (Table 4.1) and range between -20% and -30% in the period after June 2009, compared to the pre-recession years. However, as also found in Chapter III, aggregate unemployment rate does not affect the transition to first birth (Table 4.2) when individual-level control variables such as education, marital status and birth cohort are included: the point estimates are negative but very small and often not statistically significant.

Before turning to the results on the individual-level employment and occupational mobility explanatory variable, it is worthwhile addressing briefly the already-mentioned issue of the mediating variables. As explained, the Great Recession affects fertility also indirectly through the effect that it has on the propensity to marry and to stay in education.

Even though not the focus of this investigation, I checked this mediation effect of education and marital status on the aggregate effect of the crisis on the odds of the first birth and I do find a slight reduction of the period effect of the recession when I introduce marital status as a control variable but no change at all in the effect when education is introduced in the model (results are available in Table A3.4 in Appendix 3). The reduction in the negative effect of the crisis on childbearing when marital status is controlled for seems to be concentrated on the period post-June 2009 and the difference is of around 10 percentage points less in the odds ratio (see Models 2-3 in Table A3.4).

As far as the controls are concerned, the number of siblings, as suggested by the literature, positively affects the odds of first birth. African American women have slightly higher odds ratios of first birth compared to White non-Hispanic while women of other ethnicities have smaller odds of becoming mothers, although the point estimates are not statistically different from zero. This confirms the results from official statistics that Black women tend to have more children than White non-Hispanic women (CDC 2012). Controlling for marital status, cohort, race and employment and occupational mobility, higher education still correlates positively to a faster transition to the first child, but the point estimate is small (besides Tables 4.1-4.2 see also Table A3.4 in Appendix 3)[189].

I now turn to the impact on the transition to first birth of the individual-level explanatory variable, namely women's employment and intergenerational occupational mobility. Besides the negative aggregate effect of the crisis in its period specification, in fact, I find a significant effect on childbearing of the individual-level activity status: compared to downward mobile women, the odds ratio of first birth for both (immobile and) upward mobile and non-employed women are larger. The odds are more than twofold for women out of the labor force or unemployed and 25-30% larger for upward mobile women (see Models 2-3 in Tables 4.1 and 4.2).

[189] We do not know, however, whether these higher births to more educated women are births to married, cohabiting or single women. The empirical evidence on this issue is mixed. Aassve (2003) finds that both women's high education and high predicted wages (variables strongly correlated with upward mobility) reduce the hazard of premarital childbearing. Other studies show that in North America a higher socioeconomic status is associated with a less complex life-course (de-standardized) trajectory where men and women tend to follow more traditional pattern. Highly educated American women tend to have a smaller probability of living alone, informal cohabitation and out-of-wedlock births (Rajulton et al. 2010). However, a recent sequence analysis study concentrating on the US shows that coming from a higher social class (parental education) instead reduces the likelihood of experiencing a traditionally structured life course (Sironi et al. 2015). Accordingly women with a higher socioeconomic status should be more likely to experience premarital births.

Table 4.1: Period effect of the Great Recession on the transition to first birth.

	Model (1)	Model (2)	Model (3)
Pre- Recession: <Dec 2007 (Ref. Cat)	-	-	-
Recession: Dec2007-Jun2009	0.67***	0.71***	0.92
	(0.55 - 0.82)	(0.56 - 0.91)	(0.61 - 1.39)
Post-Recession: >Jun2009	0.80*	0.71**	0.71
	(0.64 - 1.01)	(0.53 - 0.96)	(0.44 - 1.14)
Downward mobile (Ref. Cat)		-	-
Upward mobile		1.25**	1.30*
		(1.02 - 1.55)	(0.97 - 1.74)
Out of Labor Force		2.18***	2.55***
		(1.70 - 2.80)	(1.84 - 3.55)
Recession x Out of Labor Force			0.63
			(0.35 - 1.12)
Recession x Upward mobile			0.73
			(0.44 - 1.19)
Post-Recession x Out of Labor Force			0.79
			(0.44 - 1.44)
Post-Recession x Upward mobile			1.17
			(0.69 - 2.01)
Cohort <1974 (Ref. Cat)	-	-	-
Cohort 1974-1980	1.93***	2.00***	2.01***
	(1.40 - 2.66)	(1.37 - 2.93)	(1.37 - 2.95)
Cohort >1980	3.64***	3.97***	3.97***
	(2.30 - 5.77)	(2.31 - 6.80)	(2.31 - 6.83)
Single (Ref. Cat.)	-	-	-
Married	5.92***	6.44***	6.44***
	(4.47 - 7.84)	(4.66 - 8.90)	(4.65 - 8.90)
Cohabiting	3.27***	2.91***	2.90***
	(2.34 - 4.58)	(1.95 - 4.34)	(1.94 - 4.33)
Divorced/Separated	1.24	1.63	1.66
	(0.67 - 2.30)	(0.82 - 3.24)	(0.84 - 3.29)
Years completed Education	1.01	1.05**	1.05**
	(0.97 - 1.06)	(1.00 - 1.11)	(1.00 - 1.10)
Number of Siblings	1.06***	1.05*	1.05*
	(1.02 - 1.10)	(1.00 - 1.10)	(1.00 - 1.10)
White non-Hispanic (Ref. Cat)	-	-	-
African American	1.04	1.05	1.06
	(0.90 - 1.21)	(0.87 - 1.27)	(0.88 - 1.28)
Other race	0.93	0.83	0.83
	(0.68 - 1.27)	(0.53 - 1.30)	(0.53 - 1.29)
US State FE	YES	YES	YES
N	19354	15245	15245

Source: Elaboration od the author based on PSID data.

Note: Odds rations with Confidence Intervals in parentheses. *** p<0.01, ** p<0.05, * p<0.1. State unemployment centered at the mean

Table 4.2: Unemployment effect on the transition to the first birth.

	Model (1)	Model (2)	Model (3)
Unemployment Rate (Cent.)	0.97	0.96*	0.94
	(0.93 - 1.01)	(0.91 - 1.01)	(0.87 - 1.02)
Downward mobile (Ref. Cat)		-	-
Upward mobile		1.26**	1.18
		(1.03 - 1.56)	(0.93 - 1.51)
Out of Labor Force		2.18***	2.17***
		(1.69 - 2.80)	(1.63 - 2.89)
Out of Labor Force*Unemployment Rate (Cent.)			1.00
			(0.90 - 1.12)
Upward mobile*Unemployment Rate (Cent.)			1.05
			(0.96 - 1.15)
Cohort <1974 (Ref. Cat)	-	-	-
Cohort 1974-1980	1.68***	1.71***	1.71***
	(1.24 - 2.28)	(1.20 - 2.44)	(1.20 - 2.44)
Cohort >1980	2.78***	2.93***	2.93***
	(1.85 - 4.18)	(1.84 - 4.68)	(1.84 - 4.67)
Single (Ref. Cat)	-	-	-
Married	6.01***	6.65***	6.65***
	(4.52 - 7.99)	(4.78 - 9.24)	(4.79 - 9.25)
Cohabiting	3.34***	3.03***	3.03***
	(2.38 - 4.69)	(2.03 - 4.53)	(2.03 - 4.53)
Divorced/Separated	1.28	1.69	1.70
	(0.70 - 2.37)	(0.85 - 3.36)	(0.86 - 3.37)
Years completed Education	1.01	1.05**	1.05**
	(0.97 - 1.05)	(1.00 - 1.10)	(1.00 - 1.10)
Number of Siblings	1.07***	1.05**	1.05**
	(1.03 - 1.11)	(1.00 - 1.10)	(1.00 - 1.10)
White non-Hispanic (Ref. Cat)	-	-	-
African American	1.05	1.06	1.07
	(0.90 - 1.22)	(0.88 - 1.28)	(0.88 - 1.29)
Other race	0.93	0.82	0.82
	(0.67 - 1.27)	(0.53 - 1.28)	(0.53 - 1.28)
US State FE	YES	YES	YES
N	19265	15190	15190

Source: Elaboration od the author based on PSID data.
Note: Odds rations with Confidence Intervals in parentheses. *** p<0.01, ** p<0.05, * p<0.1. State unemployment centered at the mean

Table 4.3 merges the two indicators of the crisis, the period effect and the unemployment rate effect (net of state fixed effect). The table, first, confirms that individual-level characteristics – in particular birth cohort and marital status – cancel the effect of aggregate unemployment (Models 1-2). Second, the table confirms that the positive effect of the period after June 2009 in Model 1 masks in fact a cohort effect (the youngest cohort turns around 28-29 years old in 2009, the peak age of first birth in the US): net of birth cohort, marital status, education, race and number of siblings there is a negative period effect on the odds of the first child especially in the recession months between December 2007 and June 2009 compared to the pre financial crisis period, that goes beyond the rise in unemployment rates (Model 2). The negative crisis-period impact remains the same even controlling for individual-level employment and mobility conditions (Model 4), moreover adding the individual-level employment covariates seems to increase the negative effect in the period after mid-2009, but the point estimates are not precise. All in all, the results in Table 4.3 are almost identical to those of Table 4.1, meaning that including aggregate unemployment rates beyond the period specification of the Great Recession does not add much to the analysis.

Table 4.3: Unemployment and period effect on the transition to the first birth.

	Model (1)	Model (2)	Model (3)	Model (4)
Unemployment Rate (Cent.)	0.94**	0.97	0.99	0.99
	(0.89 – 0.99)	(0.91 - 1.03)	(0.92 - 1.06)	(0.92 - 1.06)
Pre- Recession: <Dec 2007 (Ref. Cat)	-	-	-	-
	0.90			
Recession: Dec2007-Jun2009	(0.76 – 1.07)	0.70***	0.73**	0.94
	1.31*	(0.56 - 0.86)	(0.56 - 0.94)	(0.61 - 1.44)
Post-Recession: >Jun2009	(0.99 – 1.74)	0.91	0.76	0.75
		(0.64 - 1.31)	(0.49 - 1.16)	(0.43 - 1.30)
Downward mobile (Ref. Cat)			-	-
Upward mobile			1.26**	1.31*
			(1.02 - 1.55)	(0.98 - 1.75)
Out of Labor Force			2.18***	2.54***
			(1.70 - 2.80)	(1.83 - 3.55)
Recession x Out of Labor Force				0.64
				(0.36 - 1.13)
Recession x Upward mobile				0.72
				(0.44 - 1.19)
Post-Recession x Out of Labor Force				0.79
				(0.44 - 1.44)
Post-Recession x Upward mobile				1.17
				(0.68 - 1.99)
Cohort <1974 (Ref. Cat)		-	-	-
Cohort 1974-1980		1.91***	1.99***	1.99***
		(1.38 - 2.63)	(1.35 - 2.91)	(1.36 - 2.93)
Cohort >1980		3.51***	3.87***	3.88***
		(2.21 - 5.57)	(2.26 - 6.64)	(2.26 - 6.66)
Single (Ref. Cat)		-	-	-
Married		5.99***	6.59***	6.59***
		(4.50 - 7.96)	(4.74 - 9.17)	(4.74 - 9.17)
Cohabiting		3.35***	3.02***	3.01***
		(2.39 - 4.70)	(2.02 - 4.52)	(2.01 - 4.50)
Divorced/Separated		1.27	1.68	1.71
		(0.69 - 2.34)	(0.84 - 3.33)	(0.86 - 3.39)
Years completed Education		1.01	1.05**	1.05**
		(0.97 - 1.06)	(1.00 - 1.11)	(1.00 - 1.11)
Number of Siblings		1.06***	1.05**	1.05*
		(1.02 - 1.11)	(1.00 - 1.10)	(1.00 - 1.10)
White non-Hispanic (Ref. Cat)		-	-	-
African American		1.05	1.06	1.07
		(0.90 - 1.22)	(0.88 - 1.28)	(0.88 - 1.29)
Other race		0.93	0.83	0.83
		(0.68 - 1.27)	(0.53 - 1.29)	(0.53 - 1.29)
US State FE	YES	YES	YES	YES
N	24668	19265	15190	15190

Source: Elaboration od the author based on PSID data.

Note: Odds rations with Confidence Intervals in parentheses. *** p<0.01, ** p<0.05, * p<0.1. State unemployment centered at the mean

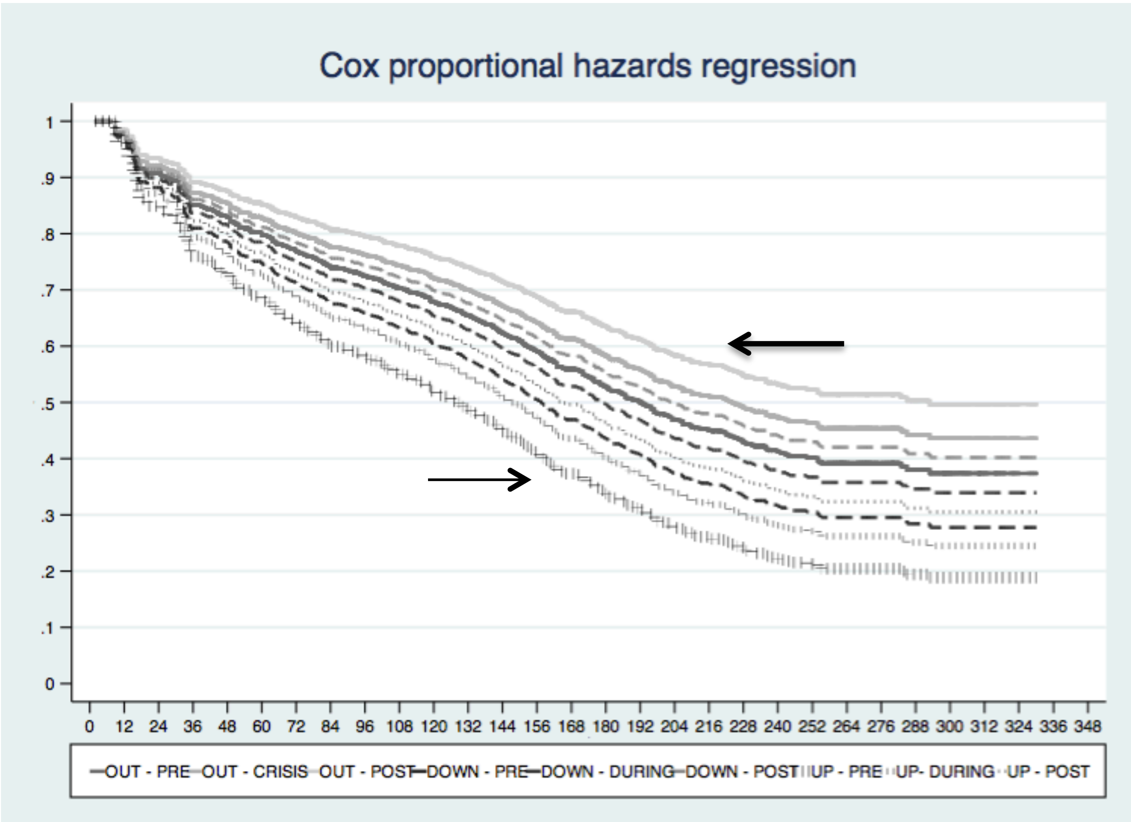
Finally, I conclude the analysis looking at the cross-level interactions.

The interaction terms between aggregate and individual explanatory variables (Model 3 in Tables 4.1-4.2) are never statistically significant, and their interpretation in event history models is not straightforward as it is in linear models[190]. A useful tool for a more intuitive interpretation of results is given by predicted survival curves depicted in Figures 4.4-4.5. The use of predicted survival curve as a post-estimation tool to graphically illustrate models' estimate is very common in epidemiology and medial studies but it has been used also in sociology, demography and economics studies (see for instance Rondinelli, Aassve and Billari 2006, 2010; Guzzo and Furstenberg 2007).

Predicted survival curves plot the Cox model estimated survival function at specific values of the covariates (or at the mean if no value is specified). The estimation command[191] in Stata first compute the baseline survival function (all covariates at zero) and then modifies it based on the values imputed for the covariates. In practice I specified, and plotted together, nine profiles of women combining the phases of the recession (pre-, during and post-) with the employment and occupational mobility statuses (out of the labor force, downward and upward mobile episodes).

Results have to be interpreted cautiously though since the cross-level interactions are very imprecisely estimated in the models (never statistically significant, see Tables 4.1-4.2).

Figure 4.4: Predicted survival curves of activity status and period effects.



Source: Elaboration of the author based on PSID survey.

190 Substantial profiles with different combinations of the interacting variables should be calculated from beta coefficients (not the odds ratios reported in the tables) and then re-transformed into odds ratios.

191 Easy to get in Stata with the command *stcurve*.

Figure 4.4 shows the predicted survival curve of substantial profiles of women in different combinations of employment and mobility status and periods. The origin is set to 17 years old (zero in the x axis). The solid lines indicate women in non-working episodes, the dashed lines indicate downward mobile women and dotted lines the upward mobile. The darker color of the lines indicates earlier periods.

According to the Cox model tested in the analyses, the survival probability to first birth among women in the sample (Model 3 in Table 4.1) is the lowest for upward mobile women before the onset of Great Recession (dotted thick black line at the bottom in Fig. 4.4, indicated by the arrow). Upward mobile women before December 2007 thus tend to have the first child faster: for instance, by the age of 30 (156 months after turning 17), only 40% of the upward mobile women in the pre-crisis period were still childless compared to the 70% of the non-working women in the post June 2009 period (the solid grey line at the top in Fig. 4.4, indicated by the thick arrow). The latter is in fact the group with the slowest transition to childbearing (non-working women in the post-recession period).

Between the two extreme profiles, there is a gradient within each employment and mobility status of slower transition to first birth the further we enter into the recession and post-recession periods. In other words, keeping constant the employment or mobility status, women tend to become mothers later after the onset of the crisis compared to the pre-recession period. Furthermore, there is a gradient also within each period, with smaller risk of first child of non-working women (solid lines), followed by those downward mobile (dashed lines), and finally the highest risk of first birth is that of upward mobile women (dotted lines).

Importantly, note that there seems to be no recuperation in completed fertility of first birth between these groups of women. At 44 years old still 50% of women out of the labor force after June 2009 are childless while only 20% of the upward mobile women before December 2007 had no children by the age of 44. This last result seems surprising and might mask the cohort effect illustrated in Figure 4.1.

To check this, Figure 4.5 plots the predicted survival curves (for simplicity's sake for employed women only) for different combinations of occupational-mobility status and crisis periods, by cohorts.

Within each cohort the pattern identified is the same: positive intergenerational mobility (solid lines) is associated with a faster transition to first birth compared to downward mobility (dotted lines), especially before the onset of the economic and financial crisis at the end of 2007.

However, younger cohorts have in general lower survival functions, meaning that women born after 1974, and especially those born after 1980, independent of their mobility status and the recession period, at the same age have a greater probability of having their first child earlier compared to women born before 1974. As mentioned, this is due to a process of selection[192]: since women enter the survey at different ages, but they have to be childless to enter my sample, those in the older cohort are women

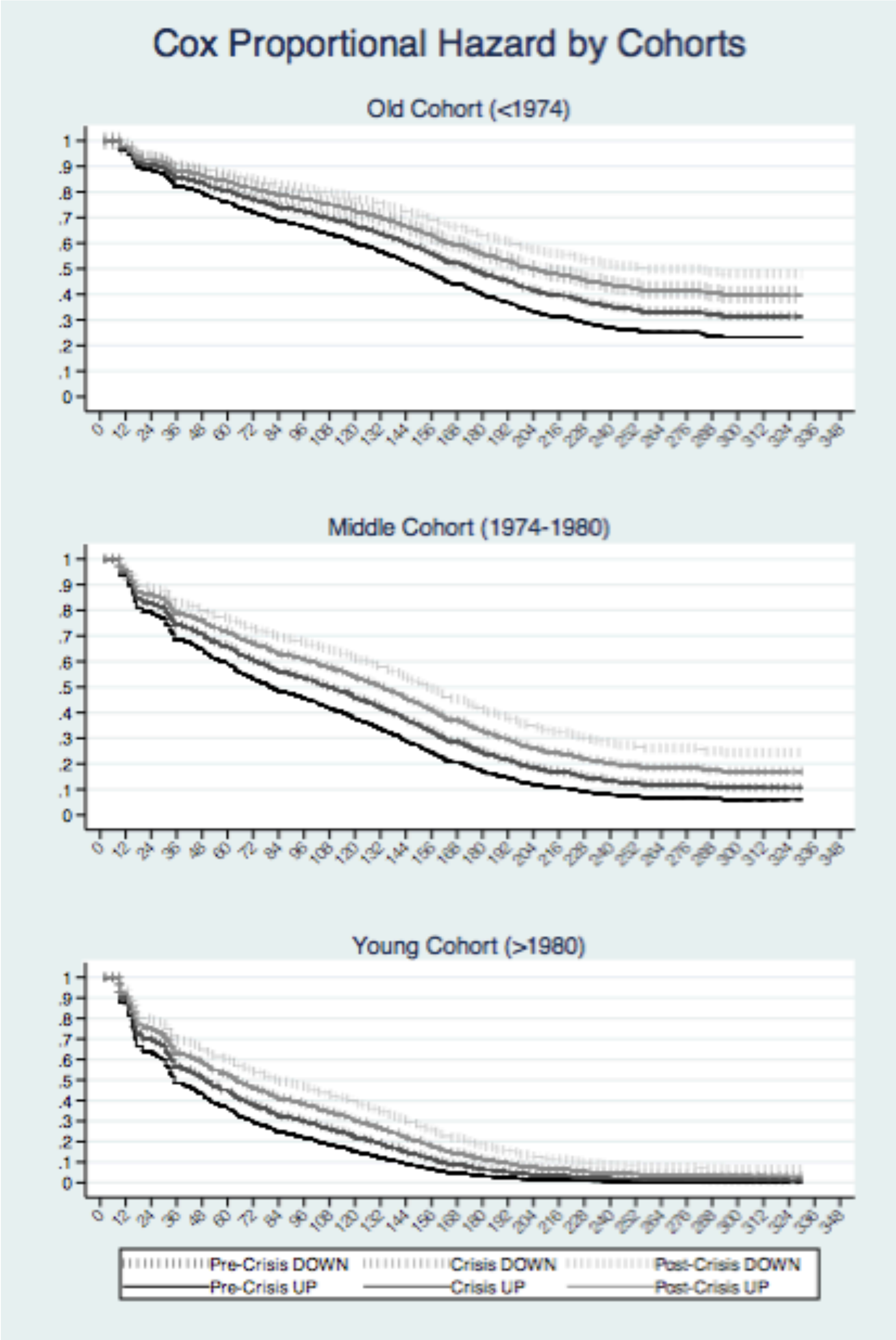
[192] Only partially handled by specifying the entry date into the survey of each observation. See Section 3 for details.

that are childless in 2001, when they are at least 27 years old, clearly a particularly selected group of women. This is also the reason why I do find the recuperation of first births (complete fertility of first births is the same at the end of the reproductive period) between women of different occupational and period profiles, only in the youngest cohort (the less-selected).

In sum, the cross-level interactions seem to confirm the results of the analysis conducted on couples in the previous chapter, where the probability of first birth for couples with non-working women was found to be lower compared to dual-earner couples. The two models are very different since in one we compare couples, and only the status of working versus non-working of the two partners, while here we look only at women but we compare occupationally upward mobile versus downward mobile women to non-working women.

The two analyses suggest a similar answer to the question of the cross-level interaction effect on the transition to parenthood, namely that the crisis had a multiplicative negative effect on the probability of making this transition, on top of couples, or individual, labor market uncertainty.

Figure 4.5: Predicted survival curves of activity status and period effects, by cohort.



Source: Elaboration of the author based on PSID survey.

6. Conclusions

The aim of this chapter was to investigate the role of women's employment status *and* intergenerational occupational mobility on the transition to first births in the United States during the Great Recession. Compared to the previous chapter, here I focus only on women and I measure the effects on the transition to motherhood for non-working[193] women compared to those who work and have either moved up (or are immobile) or down in the occupational socioeconomic scale with respect to their parents.

The first hypothesis tested through the model described by equation (1) in Section 3 is Easterlin's relative economic status hypothesis, which assumes that the hazard of the transition to the first child depends on the ratio between resources, i.e. the socioeconomic (occupational) status achieved and women's aspirations, i.e. the socioeconomic status of the family of origin at the time when they were growing up. Easterlin's argument is that the transition to the first birth is determined not by women's absolute socioeconomic status but on the ratio between that and her aspirations. The latter are formed during adolescence and are based on the socioeconomic status of the parents.

The Great Recession affects this process by altering the numerator of this ratio, women's occupational achievements. This implies a drop in the income streams but it might also imply that in economically insecure periods individuals are more likely to accept jobs for which they are over-qualified and thus might be more likely to find themselves socioeconomically downward mobile with respect to their aspirations. In the analyses I test whether this hypothesis holds for American women.

The second hypothesis I investigate in this chapter (as in the previous one) is the interplay between the change in individual-level occupational status and the change in the aggregate conditions of the economy, on women's transition to the first birth. As described in Chapter III (Section 2.2), on the one hand, the crisis might have the additional consequence of multiplying the feeling of uncertainty and thus adding to the negative individual-level consequences of job insecurity for childbearing. On the other hand, it is possible that when opportunities decline in parallel for everyone in the labor market, one's own relative socioeconomic position may matter less, reducing the burden of personal difficulties in the labor market on childbearing decisions. In the latter case, I would have expected to see a smaller negative effect of downward mobility or unemployment during the economic crisis compared to the years prior to that. The intuition is the following: if a person is the only one worse off in a world of large opportunities, his/her 'misfortune' (or inability) might weigh heavily in

[193] An important drawback of this third chapter is that, due to the survey design I could not separate the episodes of unemployment from those of non-employment (mainly represented by housewives and student) as instead I could do in Chapter III.

making a decision such as that of having a child. In contrast, if one sees that a lot of other people are facing the same imbalance between resources and aspirations as he/she is, when making decisions he/she might be less concerned with his individual position[194].

Using the Panel Survey of Income Dynamics (PSID) as in the previous chapter, I applied a Cox Proportional model to the hazard of having the first child among women older than age 17 in the period 2001-2011.

The first main finding of this chapter is that there is a substantial negative period effect on the transition to motherhood (net of state fixed effect) both during the eighteen months of formal recession and in the two years after June 2009, when the odds of first birth are around 30% less compared to the previous pre-crisis period. This is a very robust result across all model specifications (see Tables 4.1-4.4).

However, as also found in Chapter III, aggregate unemployment rate does not affect the transition to first birth (Table 4.2), when individual-level control variables such as education, marital status and birth cohort are included: the point estimates are negative but very small and often not statistically significant.

At the individual level the estimates of the effect on first births of the variable of activity status, operationalized as a combination of employment status (whether the woman is employed or non-employed) and intergenerational occupational socioeconomic mobility, support the Easterlin Hypothesis. Intergenerationally upward mobile women have a higher risk of first birth compared to downward mobile women of around 25-30%.

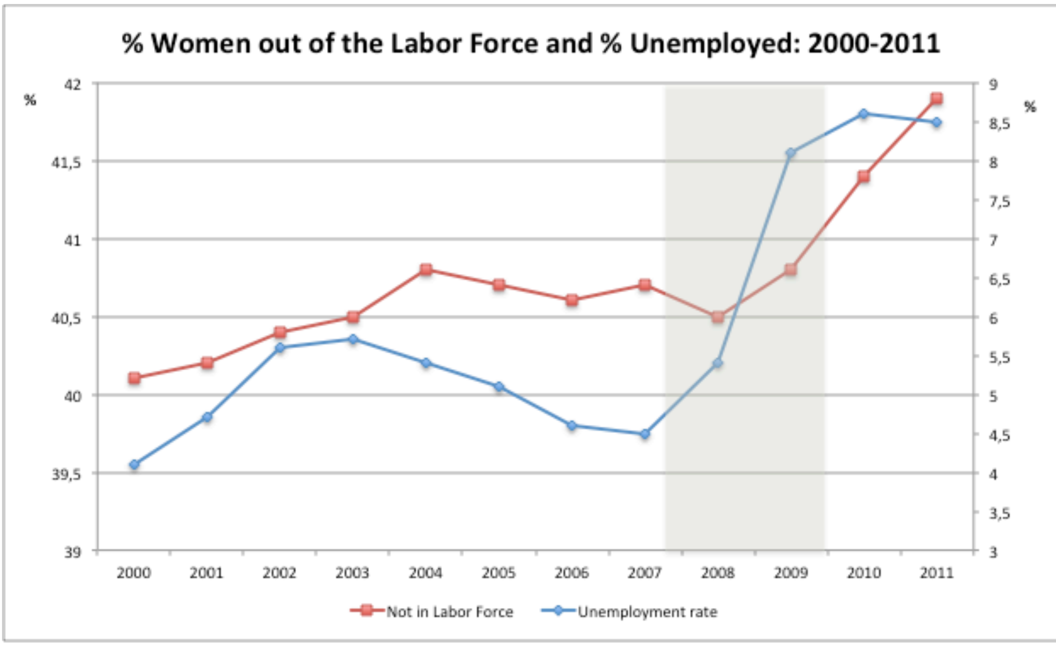
The results also show that non-working women too have a much higher risk of first birth than downward mobile women. However, the estimates have to be interpreted with some caution. What is crucial with this respect is that the composition of the non-working group of women changes over time, with the proportion of them being unemployed increasing during the recession and the number of out of labor force shrinking.

Looking at the estimates of the Bureau of Labor Statistics[195], reported in Figure 4.6, between 2007 and 2011, in fact, female unemployment rate (right axis scale) increased by more than 4% while the percentage of women not in the labor force (left axis scale) increased by only 1.5%.

For my findings this means that when we consider the effect of the non-employment condition on the transition to first birth we are not taking into consideration this change in the composition of the group over time. The two subgroups of women have very different propensities to childbearing and also, as demonstrated in the previous chapter, the effects on childbearing for non-working women depend on their partners' working status. This is likely the reason why I find different results when I plot the substantive profiles of women in different employment status across the recession periods.

[194] Relative Deprivation (Crosby 1976; Gambetta 1996; Olson, Herman and Zanna 1986; Stouffer 1949).
[195] Also recall the descriptive statistics in Chapter III.

Figure 4.6: Trends in women labor force participation and unemployment rate.



Source: Bureau of Labor Statistics. http://www.bls.gov/cps/wlf-databook-2013.pdf

As explained, the interpretation of the interactions in the Cox model is not straightforward since the model is not linear. In an attempt to draw clearer conclusions Figure 4.4 illustrates substantive profiles of women in different activity status across different phases of the business cycle via their predicted survival curves.

Within each period, the largest survival time to first birth is that of women in non-working episodes, while the smallest survival is for women when they are employed and non-downward mobile with respect to their parents[196]. Women out of the labor force are the slowest to have their first child while upward mobile (or immobile) women are the fastest, independent of the period.

The Great Recession has a multiplicative negative effect increasing the survival time to first birth all the activity statuses (employment and mobility). However, recalling that non-working women in the non-interaction model had the highest risk of first birth (Table 4.1) and then, in the interaction model (Figure 4.3) they become the slowest during and after the recession, we see that the crisis had a much larger negative impact on non-working women, compared to those employed.

196 I do not find different results on the interactions and the survival curves when I plot two separate figures for single and partnered women.

In conclusion this fourth chapter shows first that there is a negative period effect of the economic crisis that goes beyond the rise in aggregate unemployment and the individual-level occupational status of women. As much as in Chapter III, aggregate unemployment rate is not a good proxy in micro-level analyses of the negative impact of the Great Recession on first births (at least for nonspecific age-groups).

Second, the empirical findings demonstrate that intergenerational mobility matters for the transition to motherhood and women do actually take into consideration their personal socioeconomic aspirations when they decide to have the first child (Easterlin Hypothesis).

Finally, both findings in Chapter III and IV tend to exclude the possibility of any moderating effect of aggregate macroeconomic conditions, supporting instead the opposite hypothesis of a negative multiplicative effect of individual-level employment insecurity on the transition to the first child, especially for non-working women.

In the next chapter I start from the results obtained in Chapters II-IV and in particular from the cohort differences highlighted here (recall Fig. 4.5 in this chapter). Turning the subject around, the focus of Chapter V is, in fact, cohort childlessness among women close to end of their reproductive life, and how the Great Recession has affected it.

CHAPTER V

THE CAUSAL EFFECT OF THE GREAT RECESSION ON CHILDLESSNESS OF WHITE AMERICAN WOMEN.
A DIFFERENCE-IN-DIFFERENCE APPROACH USING PSEUDO-PANELS.

1. Introduction

The central idea of this dissertation is that economic and labor market uncertainties are important determinants of the postponement of childbearing in contemporary society (Goldstein et al. 2013; Kreyenfeld and Andersson 2014; Sobotka et al. 2010, 2011).

Despite being of small magnitude and mostly entailing only a postponement of births, the negative effect of economic hardship on fertility is an established finding in the literature (G.S. Becker 1960; Ermisch 1988; Rindfuss et al. 1988; Macunovich 1996; Giersbergen and de Beer 1997; Meron and Widmer 2002; Adsera 2004; Dehejia and Lleras-Muney 2004; Fokkema et al. 2008; Adsera 2011; Morgan et al. 2011; Sobotka et al. 2010, 2011; Currie and Schwandt 2014; Del Bono et al. 2014; Kreyenfeld and Andersson 2014; Inanc 2015).

The investigation conducted up to now in the first three empirical chapters has already added to this literature in different ways.

Chapter II of this thesis shows that at the aggregate level there is a strong negative correlation between both rising unemployment and financial and policy uncertainty and fertility rates both in the US and in Europe. The two following chapters (III-IV) address some of the potential mechanisms through which the Great Recession could have had an impact on first births in the United States: first, whether aggregate employment conditions and couples' occupational status affect the probability of having the first child and whether the two levels interact in shaping parenthood (Chapter III). The second mechanism that is investigated is the Easterlin Hypothesis of relative socioeconomic status (Easterlin 1961, 1976, 1987) and its impact on the hazard of transition to the first birth for American women (Chapter IV)[197].

The micro-level results seem to highlight a negative period effect of the crisis on the transition to the first birth, not fully accounted for when using aggregate unemployment rates rather than a more comprehensive pre/post-recession specification. At the individual level, couples' employment status combination matters substantially in all periods but there seems to be a moderate multiplicative negative effect on the first birth of the Great Recession on top of couples' employment insecurity (Chapter III). Any couple in an occupational combination different from that of the dual earners has a significantly lower probability of becoming parents, even though the effect is particularly negative in case of the husband's job loss (independent of whether the wife is working or not).

In addition, the empirical analysis conducted in Chapter IV supports the Easterlin Hypothesis of the impact of relative socioeconomic status on the transition to motherhood. The odds of first birth for downward mobile American women are lower than those of immobile or upward mobile women.

As already stressed in previous chapters, the literature addressing the impact of economic crises on childbearing behavior is extensive but it is still dubious whether the negative association observed at the aggregate level, and confirmed in many micro-level studies (including the findings in Chapters II-IV of this dissertation), is causal or not. With few exceptions (Del Bono, Weber, and Winter-Ebmer 2014; Dehejia and Lleras-Muney 2004; McKenzie 2003), most studies in fact are based on associational evidence of macroeconomic indicators to fertility and it is risky to interpret the observed relationship as causal.

For this reason, in this chapter I move forward the debate on the fertility response to business cycles fluctuations, taking a necessary step back with respect to the mechanisms addressed in the previous chapters and investigating the existence of a *causal* effect of the Great Recession on fertility, exploiting a design-based, instead of a model-based, analysis (Angrist and Pischke 2010; Rosenbaum and Rubin 1983; Rubin 1974, 2007).

In particular, here I make two important contributions to the existing literature[198]. First, I focus on the effect of the Great Recession on the childbearing behavior of childless women at age 34-36 at the beginning of the economic crisis in 2007. Previous studies have shown that economic downturns are typically associated with a postponement of fertility, but a postponement of the first child for these women is critical because after 40 it becomes increasingly difficult to conceive. By focusing on this specific age group we can then approximate the effect of Great Recession on permanent childlessness, at least for a given cohort of White American women, born between 1971 and 1973. First birth rates after age 40 have notably increased since the 70s in the US and in other western countries, but it is still

[197] The analyses in the two chapters are conducted using different statistical methods (Linear Probability Panel Fixed Effect model and Event History Analysis Cox Proportional model respectively).

[198] A reduced version of this chapter, co-authored with Fabrizio Bernardi, has been published in the IZA Journal of Labor Economics in November 2015.

so low (2.3 births for 1000 women aged 40-44 in 2013, CDC) that any major catch-up process after age 40 is unlikely.

Second, the chapter presents a novel identification strategy that can be profitably applied to investigate the causal effect of the Great Recession (or of any other aggregate shock or period effect) in other countries and to other outcomes, circumventing the problem of identifying a control group in cases where the treatment has spread across space and social groups.

As a matter of fact, it is particularly cumbersome to identify the causal link between the Great Recession and childbearing for many reasons. The complexity of the decision-making process leading to parenthood - highlighted also in the previous chapters - is one of those reasons. Fertility choices are related to many other life domains and endogenous to many other life-course decisions, making it extremely arduous to single out the effect of one factor (in our case the economic environment) on the choice of having a baby or not. Moreover, also reasoning within the causal inference framework, the identification of an effect is made burdensome by the fact that it is extremely hard to find an appropriate control group. As described in the previous chapters, the Great Recession spread – though with different intensity – all over developed countries, within the US over all states, and all over socio-demographic groups, which makes it difficult to find two comparable groups of individuals, one hit by the crisis and the other not.

The solution I adopt in this chapter is to compare similar groups of women, not across space, but across time, combining the difference-in-difference (DD) method (Angrist and Pischke 2009; Bertrand, Duflo, and Mullainathan 2004; Donald and Lang 2007; Lechner 2010), with the synthetic cohort approach (Deaton 1985; Duncan et al. 2007; Russell and Fraas 2005; Verbeek 2008).

The research-design exploits the fact that the socialization environment of some women, at a certain point in their life cycle, shifts due to the crisis (Dinas and Stoker 2014)[199]. The specific point in the life course I refer here is women's last years of reproductive life, and the treatment and control groups of women differ with regard to the time period at which they turn a specific age. I focus on childless women close the their forties and differentiate between the treated women, who spent the last years of their reproductive life during the Great Recession, and the control group's women who spent the last years of their reproductive life before the onset of the crisis. This design can be described as 'treatment at a specific age'[200] where women are grouped according to some time-invariant characteristics, like year of birth and race, and then with difference-in-difference we compare the probability of being childless at the beginning and at the end of the last reproductive years in the two groups, treatment and control.

[199] As Dinas and Stoker (2014) put it "those women going through their impressionable years in the new environment would end up distinctive relative to those going through their impressionable years in the old environment" (Dinas and Stoker 2014: 30). Although I exploit this broad concept that spending a particular period of the life cycle in a specific environment entails particular behavioral consequences (in my case for fertility), the *impressionable years* hypothesis (typically used in political sociology and here cited by Dinas and Stoker 2014) refers to the impact of socialization of adolescents and young adults in a specific context (historical, political, economic, cultural etc.) that shapes their attitudes, preferences and political identification. In my investigation though I do not refer to this specific theory nor to the part of the life cycle pertaining to adolescence but to the group of women approaching the limits of biological fertility.

[200] Or 'at a single point in the life cycle' as in Dinas and Stoker (2014).

More precisely, we apply a DD approach to the probability of childlessness in two pseudo-cohorts of women: those who reached the age of 34-36 being childless before the crisis, in 2004, and those turning 34-36 and being childless in 2007, at the onset of the crisis[201]. We then study how many of these childless women had a child by the age of 37-39, i.e. between the years 2004 and 2007 for the control group and between the years 2007 and 2010 for the treatment group. Our identification strategy relies on the assumption that these two adjacent cohorts of women differ only because the latter cohort lived some critical years of their reproductive life, those between age 34 and 39, during the Great Recession period. Pre-treatment differences in fertility trends in the two cohorts can be taken into account using a DD design[202].

To test the robustness and to further strengthen the credibility of the results, we conduct identical analyses on two parallel US census datasets: the American Community Survey (ACS) and the Fertility Supplement of the Current Population Survey (June CPS). Internal replication is still rare in the social sciences literature; nonetheless it is a fundamental tool to substantiate findings and validate results as with repeated trials. Internal replication is especially useful in the case of large datasets, like the ones we use in this paper, where sampling error - the only source of uncertainty that confidence intervals (standard errors) engage with - is less worrisome compared to other sources of uncertainty deriving from the data collection process (Firebaugh, 2008). In this specific case the source of uncertainty addressed is measurement error in the dependent variable, since childlessness is measured with some noise in the ACS sample. Finding analogous results in the two surveys would suggest that our causal estimate of the effect of the Great Recession on childlessness is not an artifact of specific survey questionnaire attributes.
As complementary analyses, we have also applied the same DD design to different age groups and used a different identification scheme studying the effect of unemployment rates on childlessness rates of 37-39 year-old women in the last twelve years, controlling for state and year fixed effects[203].

After this introduction, the rest of the chapter is organized as follows: Section 2 positions the study into the theoretical, methodological and empirical background of reference, concerning in particular the causal inference framework and the application of such research designs to studies on fertility[204]. Section 3 illustrates the research design, the identification strategy and the two census datasets used to replicate the analysis, the American Community Survey (ACS) and the Fertility supplement of the Current Population Survey (CPS). The results of the analyses conducted on the ACS and on the CPS are shown respectively in Section 4 and 5. The further complementary analysis

[201] We follow the already-cited official declaration of the business cycle dating committee of the US National Bureau of Economic Research (NBER) that the Great Recession in the US began in December 2007 and ended in June 2009. Therefore we take 2007 as the last non-recession year and 2009 as the last recession year (as done for instance in Starr 2014) and, as usually done in the literature, we measure childlessness with a one-year delay in 2010.
[202] We also conducted in-depth descriptive comparisons of the treatment and control cohorts to check whether this assumption is correct and we repeated the analysis varying the age range of the cohorts as a further robustness check of our findings. See the next sections for details.
[203] As a further robustness check we also varied the age range (20-24; 25-29; 30-34) and the age bandwidth (36-40; 36-41; 37-40).
[204] For an in-depth review of the literature concerning the relationship between business cycle fluctuations, economic uncertainty and fertility behavior see Section 1 in Chapter I and Sections 2 of Chapters II-III of this thesis.

reported in Section 6 illustrates the results obtained varying the bandwidth and changing the age range as an additional check of the validity of the estimates. Finally Section 7 draws the conclusions.

In the conclusions I discuss some of the potential mechanisms driving the results and briefly highlight the socioeconomic implications of increasing childlessness. Finally I also suggest some possible applications of the "treatment at specific age with pseudo cohorts" design presented in this paper to other demographic outcomes and to other treatment beyond the Great Recession.

2. Theoretical background and empirical research

The streams of literature in which this chapter fits in are diverse. Besides the already-mentioned theoretical and empirical studies (see Section 1 in Chapter II and Sections 2 in Chapter III-IV) on the impact of economic conditions and business cycles on fertility, there are additional topics that frame and speak to the analyses conducted in this fourth empirical chapter. Two of them are more methodological in nature and concern; first, the causal inference framework, and the difference-in-difference approach and, second, the pseudo-panels (or synthetic cohorts) approach. Sections 2.1 and 2.2 illustrate these two topics. The empirical research on the application of these study designs to fertility is illustrated in Section 2.3.

Since this chapter further addresses, more specifically than the previous ones, childlessness and its determinants, Section 2.4 treats in depth the US trends in childlessness and the related empirical evidence.

2.1 The Causal Inference framework and the difference-in-difference method

2.1.1 The Fundamental Problem of Causal Inference

Without entering too much into the details of the causal inference and potential outcome frameworks, it is worthwhile briefly introducing them before treating in depth difference-in-difference, the latter being one of the most frequently used quantitative methods to estimate causal effects.

Since the late eighties, following critiques on the lack of robustness of statistical inference to changes in key assumptions (Leamer 1983), a fundamental change in the paradigm of empirical analysis (starting from the discipline of economics) occurred; a ‘credibility revolution’ according to Angrist and Pischke (2010): the shift from associational statistical inference to causal inference. In the former paradigm, the estimation of the parameters of a distribution and of the joint distribution of variables, allows one to assess the association (correlation) between the two, everything else equal, or in other words, provided that the environment doesn't change. However there is nothing from a joint distribution informative on how this joint distribution would change if external conditions changed, or that guarantees a causal link between the two variables: correlation does not imply causation. Causal inference aims instead at inferring whether a relationship stays the same when these external conditions change (Pearl 2009). Causal inference investigates what observational studies cannot identify. "Without an experiment, natural experiment, a discontinuity, or some other strong design, no amount of econometric or statistical modeling can make the move from correlation to causation persuasive. This conclusion has implications for the kind of causal questions we are able to answer with some rigor. Clear, manipulable treatments, and rigorous designs are essential" (Sekhon 2008:272).

In the early 20th century Ronald Fisher (1890-1962) established randomization as the "reasoned basis for inference" (Fisher 1935). Randomization is useful because it makes the systematic sources of bias random, and it is absent in observational studies because in the latter units are not randomly assigned to a certain condition. The causal inference problem is fundamentally a missing data problem, as defined in the potential outcome framework designed by the Neyman-Rubin causal model (Neyman 1923, Rubin 1974, Holland 1986). In other words, units are not observable in all potential situations, thus not all potential outcomes or counterfactuals are observed. The basic components of the Neyman-Rubin model are a causal state called treatment, a population within which all units could in principle be affected by the treatment, and an outcome of interest. Let $D_i(1)$ denote the units that are subject to treatment and $D_i(0)$ those that are not (control group), and $Y_i(1)$ being the potential outcome of interest for the treated units, and $Y_i(0)$ the potential outcome of the non-treated units:

$$Y_i = \begin{cases} Y_i(1)\ if\ D_i(1) \\ Y_i(0)\ if\ D_i(0) \end{cases}$$

then the observed outcome of each unit is:

$$Y_i = D_i Y_i(1) + (1 - D_i) Y_i(0)$$

therefore, a causal effect for unit i exists if the event $D_i(1)$ instead of $D_i(0)$ implies $Y_i(1)$instead of $Y_i(0)$, and it is equal to:

$$\tau_i = Y_i(1) - Y_i(0) \qquad (1)$$

Now the Fundamental Problem of Causal Inference (Holland 1986) is evident: it is impossible to observe unit *i* in both conditions. We observe the treated and the control units after the treatment but not the treated and control units *had the treatment not happened*.

Randomization of the assignment to treatment and control solves this issue by means of exchangeability of units between the two groups: units in T and C are not exactly the same but they are interchangeable. This also means that the potential outcomes and the treatment assignment are independent. The problem with observational studies is that the units are not randomly drawn, and assigned to treatment, from the same population, therefore the potential outcome between the two groups might be different under the no-treatment condition. This means that very likely there is a selection bias in the naïve regression estimates.

Economists, and more recently scholars from other disciplines in social science, are today more reluctant to base their causal claims on econometric methodology alone, realizing that design-based studies are much more *ex ante* credible because they are not data-driven only, and assumptions are made on the assignment conditions and not on the outcomes.

However, randomization is not easy to achieve outside a laboratory. As randomized experiments are time-consuming and costly, scholars turned to natural or institutional circumstances that created natural or quasi-experiments, where the perturbation of the external condition is random enough to resemble a laboratory experiment.

One of the first influential examples is the paper by Card (1990) who exploited the Mariel boatlift from Cuba to Florida as a natural experiment to study immigration. Many other examples exist of studies using natural disasters or institutional reforms, quasi-experimental designs, to identify causal effects from random assignment to treated and control groups.

Though far from offering an exhaustive list, I hereby cite some examples using various methods and from different disciplines like economics, sociology and political science.

Solon (1985) estimated the effects of unemployment insurance on the duration of unemployment by exploiting the reform carried out in some US states tightening eligibility criteria for unemployment insurance, comparing the change in job-finding rates there with those that had not changed their rules. Gruber's (1994) applied the same idea to study the incidence of state-mandated maternity benefits on public finance. Angrist (1990) and Angrist and Krueger (1991) used the quarter of birth as an instrumental variable to investigate the effects of Vietnam-era military service and schooling on earnings.

Card and Krueger (1992) also studied school quality, exploiting the variation in education spending between northern and southern US states as a natural experiment, using cohort-state aggregation as in instrumental variable.

Conley and McCabe (2011) used the sex composition of Congress members' offspring as an instrument for political contributions to study the voting behavior of legislators. Along similar lines,

Angrist and Evans (1998) used sex composition of children as an instrument of fertility to assess the impact of family size on parents' labor market supply.
Angrist and Levy (1999) used Regression Discontinuity Design (RDD) to study the effect of class size on students' achievement. The RDD method has been very popular in political science in the last 10 to 15 years, and in particular has been applied to the study of election outcomes (Lee at al. 2004; Lee 2008; Hainmueller and Kern 2008; Titiunik 2009; Eggers and Hainmueller 2009; Sekhon 2011). These researchers have exploited the existence of a threshold for being elected, arguing that candidates who barely made it are very similar to those who barely did not make it (as if in this group of candidates winners and losers were randomly assigned to one of the two conditions) [205].
As briefly shown, the causal inference paradigm is a theoretical framework that can be applied through very different quantitative methods: Matching, Instrumental Variable (IV), Regression Discontinuity Design (RDD), Panel Fixed Effects, and Difference-in-Difference (DD). The latter, since it is the methodological approach followed in the present study, is described in the next section.

[205] For a more detailed description and critique of RDD papers on election outcomes see Caughey and Sekhon (2011).

2.1.2 The Difference-in-Difference Design

The difference-in-difference (DD) estimator is probably the most popular among the empirical methods to assess causal relations. The great appeal of DD is its great computational simplicity and intuitiveness, coupled with its potential to solve endogeneity issues arising when comparing heterogeneous groups (Bertrand et al. 2004). As Angrist and Krueger (1998) explain: "DD strategies are simple panel data methods applied to sets of group means in cases when certain groups are exposed to the causing variable of interest and others are not. […] it is well suited to estimate the effect of sharp changes in the economic environment or changes in government policies" (Angrist and Krueger 1998: 1296). In its simplest setup, outcomes of the variable of interest are observed for two groups in two time periods. One of the two groups is exposed to some treatment in the second period, while the other (the control group) is not. The fixed-effect association comes from the fact that the net effect of the intervention (or treatment) is estimated across time within each group (netting out any period effects) and between groups (netting out any systematic difference between the two).
If Y denotes the outcome and the subscript T and C the treatment and control groups respectively, the DD estimate is thus:

$$\hat{\delta}_{DD} = (Y_T^1 - Y_T^0) - (Y_C^1 - Y_C^0) \qquad (2)$$

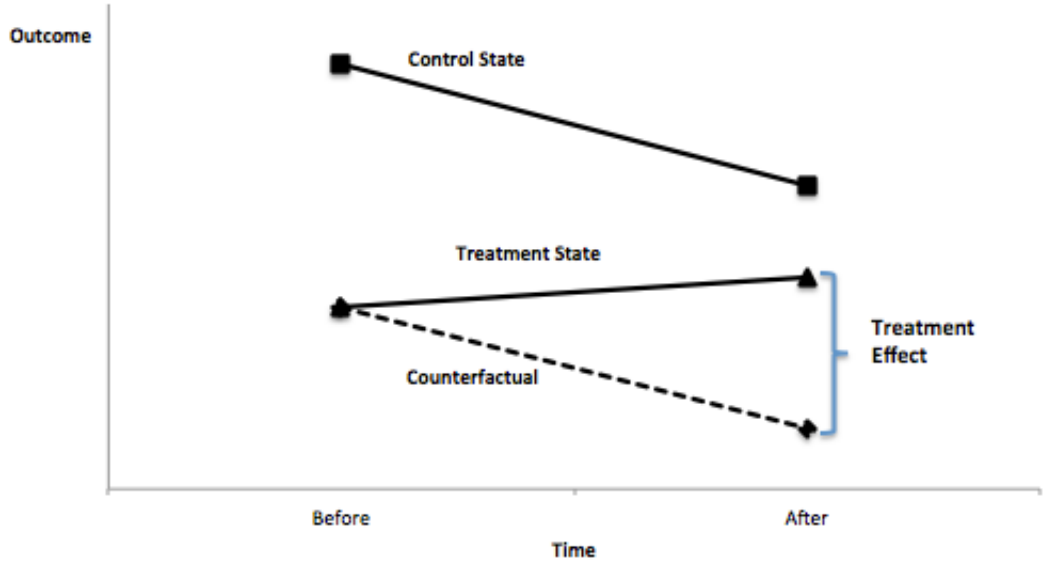
or, in regression formulation where, rewriting the notation for simplicity, D is the treatment group, *Post* is the period post-intervention, and X the eventual conditioning variables (Y is the outcome of interest as before):

$$Y = \propto + \beta X + \delta_1 D + \delta_2 Post + \delta_3 (D * Post) + \epsilon \qquad (3)$$

In (3), δ_1 captures eventual differences between the treatment and control group before treatment, δ_2 captures eventual period effects common to both groups that could affect the outcome Y, and δ_3 is the DD estimate analogous to $\hat{\delta}_{DD}$ in equation (2).
The advantages of a regression formulation is that estimates and relative standard errors are easy to get (even though there are some problems related to inference, especially in the two-by-two model, treated later on in Section 2.1.5) and the model can be easily extended to include more periods, more covariates or more treatments (see Section 2.1.4 for details). In the two periods, two groups case without conditioning covariates, precisely like computing group means as described in (2).

However, independent of the econometric formulation that is chosen, the core identifying assumption of a parallel trend doesn't change[206]: in the absence of the intervention, the outcome paths of the two groups should not be systematically different. In more formal terms, we are assuming the additive structure of the potential outcomes in the no-treatment state. This means that in absence of the reform (or any treatment) the outcome of interest is determined by the sum of a fixed-state effect (time constant) and a period effect constant to both states. This is necessary because the DD estimate attributes the entire effect to the intervention. Ideally, to convincingly prove the parallel trend assumption, the more time points available the better so that the pre-treatment trend can be extrapolated into the post-treatment period as the counterfactual. Figure 5.1 illustrates graphically the design in the case of two time points.

Figure 5.1: Identification strategy of causal effect in DD.



Source: elaboration of the author based on Angrist and Pischke (2008).

[206] See section 2.1.3 for a more detailed description.

2.1.3 Validity

As would any other methodological approach to assess causality, the internal[207] validity of a study using DD has to satisfy various assumptions, some of which are common to any other causal inference quantitative method, while some are specific to DD. Here I provide a very concise review of them.

The first assumption is the Stable Unit Treatment Value Assumption (SUTVA, or Observation rule), which states that the treatment status of any unit does not affect the potential outcomes of the other units (non-interference) and that the treatments for all units are comparable (there is no variation in treatment). In other words, the control's outcome would have been the same had the treatment not existed, and all units in the treatment group were affected by the intervention in the same way.

The second assumption concerns the conditioning variables X, under which the causal link is supposed to exist, which have to be exogenous to the treatment. Conditioning on variables measured before the treatment ensures exogeneity only if there is no anticipation of the intervention.

The third assumption is specific to DD: the No Effect of Pre-Treatment (NEPT) assumption, namely that in the pre-treatment period, the treatment had no effect on the pre-treatment population (neither on the treated nor in the control group). In other words, we need to rule out any anticipation of the intervention.

Finally, the key assumption to identify the causal effect in DD is the existence of a common trend (or Constant Bias): the non-treatment outcome overtime (conditional on X) is unrelated to belonging to the treatment or control group post-treatment. This means assuming a common (to the treatment and control groups) precedent path, a common trend before the intervention that can be different in levels between the two groups but needs to be parallel.

[207] Internal as opposed to external validity, which instead relates to the estimate being generalizable to a larger population than that subject to the treatment of interest.

2.1.4 Extensions

Up to now I illustrated only the very basic DD design but there are numerous extensions to the basic formulation, and many of them are relevant to convey greater credibility to the estimates. An important, sometimes necessary, step is to refine the definition of the two groups, treatment and control. A first very simple way to do this is to use different control groups that, compared to the original treatment group, give the same DD effect of the intervention. In a similar fashion, having a placebo group – not affected by the intervention – and comparing it to the control groups and showing that the effect of the treatment is null, gives additional strength to the results.

A finer-grained way to generate alterative comparison groups is to subdivide within the original treatment and control groups other clusters of affected and not-affected individuals. For instance, going back to the Card and Krueger (1994) example, within the treated state of New Jersey it is possible to identify sectors, other than fast-food restaurants, that are not affected by the minimum wage reform, and use those as an additional control.

When two controls are used at the same time (in the example, Pennsylvania and the other sectors in New Jersey), the method is formally defined as a Difference-in-Difference-in-Difference (DDD) estimate, since the model ends up having a triple interaction between time, states and sectors.

Another extension of the DD approach is the use of an intervention variable that considers treatment intensity in different groups, instead of a binary (0,1) variable[208]. The intensity treatment variable could represent either the degree or strength of the intervention, or the number of individuals within the state who are affected by the intervention. An example of this is the already-cited work by Angrist and Evans (1999) on the effects of teen and out-of-wedlock childbearing on education and labor-market outcomes using the 1970 US state abortion reforms. In the paper the authors instrument fertility with a measure of years of exposure to abortion reforms[209].

The last interesting extension to discuss is the inclusion of more than two time periods. The first rationale for this inclusion, if the data are available, is to test the parallel-trend assumption; the second is to weaken this assumption in cases in which it was not exactly met. Including past years in the regression formulation allows us to take into account different trends across groups: in practice this is done including year dummies plus specific state-year dummies. With the latter we are controlling for state-specific linear time trends, so that the identifying assumption is now that the remaining part

[208] Obviously in this case the analysis requires the use of a regression since group means are neither informative nor derivable anymore.
[209] Not in linear terms in this case but in the form of dummies for each possible number of years exposed.

of the time trend (around the intervention) is the same in the two groups. In addition, having many periods allows for investigating anticipatory or lagged effects of the treatment like for instance, the effect of the announcement of a reform before being put in practice, or to study the long- term impact of an intervention[210].

[210] Note that inserting lagged and past periods allows for testing for Granger Causality. The model ends up being the same testing for whether treatment effects happen after and not before treatment itself.

2.1.5 Uncertainty

A final remark has to be made concerning the sources of uncertainty in difference-in-difference analyses (even though the same line of criticism applies to any statistical inference methodology). The traditional approach, as described here, is based on the assumption that the sampling error generated by estimating the group-time means represents the only source of uncertainty in inference (J. Wooldridge, 2011). However, in difference-in-difference as in other estimation methods, sampling error is not the only source of uncertainty.

Firebaugh (2008) classifies the sources of uncertainty into two categories: measurement error and exclusion error. The latter includes all the uncertainty that comes from excluding people when moving from the population to the collected sample (including the sampling error)[211].

Recently other scholars (Bertrand, Duflo, and Mullainathan 2004; Donald and Lang 2007; Hansen 2007a,b; and Abadie, Diamond, and Hainmueller 2007) highlighted other sources of uncertainty in the estimation process, in addition to the sampling error. Bertrand, Duflo, and Mullainathan (2004) suggest the existence of serial correlation problems due to the use of in difference-in-difference models of first, long time series, second, of dependent variables that are highly positively serially correlated and third, of treatment variables that change very little within a state over time. These factors cause the estimated standard errors to substantially underestimate the standard deviation of the estimator.

A more general approach to this issue has been proposed by Donald and Lang (2007) – a perspective also taken by Abadie, Diamond, and Hainmueller (2007) – who argue that the main form of uncertainty in treatment/control studies lies in the quality of the selected control group (J. Wooldridge, 2011). In other words, the variance estimated by econometric packages includes the sampling variance but not the error due to common year/group cells, so that if the latter exists the reported *t*-statistic will be too high and a treatment effect will be found even if there is none (Donald and Lang, 2007). Moreover, in the two-by-two case, when inference is based on the comparison of means for two groups, the error variance of the group cannot be estimated only from within-sample information, and the *t* distribution is degenerate. With four means to estimate the regression produces a perfect fit with no residual variance, parameters are perfectly identified and inference cannot be performed. As Donald and Lang (2007) put it, “the analysis of the two-by-two case requires extreme caution” (Donald and Lang 2007: 227).

However, it is unclear and still debated in the literature what one should pursue in this case of aggregate studies. For instance, Abadie, Diamond, and Hainmueller (2007) argue that in aggregate-

[211] Exclusion error includes: coverage error (exclusion de to incomplete sampling frames), sampling error, and nonresponse error (unit non response).

level studies where the analysis concerns the effect of the intervention on a population (e.g. a state), the aggregate is measured without sampling error and there is no estimation uncertainty. The only kind of uncertainty these authors highlight is that related to the choice of the control group[212].
In conclusion, the issue of uncertainty in difference-in-difference studies (as also in other statistical inference techniques) is still an open question and awaits adequate investigation.

The way I address the issue in this chapter is based on Firebaugh (2008) proposal of identical analysis on parallel datasets. Together with sampling error, assessed through confidence intervals in the analysis, I deal with the issue of measurement error in the dependent variable by replicating the same analysis on two US census surveys, based on different random samples of the American population and with a slightly different way of posing the question on fertility in the survey questionnaire. Internal replication is not very diffused yet in the social sciences but it is a strong tool to substantiate results and to stem the uncertainty in our estimates.

[212] In their paper of 2007 on the effects of the California's tobacco program on smoking rates, they develop a new technique to select the control group. Briefly, instead of picking one state among the other 38 states that did not implement a tobacco program as a control, they generated a *synthetic control* group composed of a weighted average of all the potential control states. These weights are chosen based on relevant covariates of states' characteristics, so that the trend in the pre-intervention outcome and the outcome predictors are as similar as possible.

2.2 The synthetic cohort approach

In the article *The cohort as a concept in the study of social change*, Ryder (1965) defined a cohort as "[…] the aggregate of individuals (within some population definition) who experienced the same event within the same time interval. In almost all cohort research to date the defining event has been birth, but this is only a special case of the more general approach." (Ryder 1965: 845).

According to Ryder (1965), birth cohorts constitute aggregates that minimize the attrition present in the society. Each cohort has contact both with innovative and conservative forces, which results in a unique way of relating with the remaining of the society. Therefore, birth cohorts usually differ in their cultural references. Thus they will value differently education, the propensity of women to participate in the labor force, as well as possibly holding different attitudes toward risk and preferences over the life course. As Ryder highlights, each cohort is different from the others because it "embodies a temporally specific version of the heritage" (Barufi 2012).

The relevance of a cohort perspective in life-course studies is also highlighted in another passage of Ryder's paper, where he states, "the cohort record, as macro-biography, is the aggregate analogue of the individual life history. It provides the necessary temporal isomorphism for linking small-scale intensive longitudinal analyses with extensive surveys of the society at a point in time. It has the time dimension of the former and the comforting statistical reliability of the latter." (Ryder 1965: 859).

The pseudo-panel approach is a relatively new econometric approach to estimate models that circumvents the need for panel data and their associated problems (mainly, attrition). Pseudo-panel data are pooled cross-sectional data collected over time. They differ from true panel data, where information is collected repeatedly from the same individuals across waves, because what is repeatedly collected, from cross-sectional data, are random samples of individuals drawn from the same time-stable cohort. Time-stable cohort means grouping individuals according to one or more time invariant characteristics (e.g. year of birth, gender, race).

What is important is to maintain the stability of the pseudo-panel over time. This can be achieved by using only time-constant characteristics, thus avoiding individuals moving across different groups over time. As such, the fundamental assumption of pseudo-panel analysis is satisfied: the new unit of observation is not the individual but the group of similar individuals assuming, first, that we are grouping on fundamental characteristics that make people in the same group as similar as possible and, second, that the groups' composition is given and stable over time.

The pseudo-panel approach was first proposed by Deaton, in a seminal paper of 1985 entitled *Panel Data from Time series of cross-sections,* There he suggested the use of cohorts, as units of analysis, to estimate a fixed effects model from repeated cross-sections. Deaton argues that "For large enough cohorts, or large enough samples, successive surveys will generate successive random samples of individuals from each of the cohorts. […] The sample cohort means from the surveys are consistent but error-ridden estimates of the unobservable cohort population means. […] it is possible to use errors-in-variable estimators to estimate consistently the population relationship" (Deaton 1985: 110).

Subsequently, Moffit (1993) and Collado (1997) extended Deaton's work to non-linear and dynamic cases. Very interestingly, Moffit (1993) proposed an estimator based on an interpretation of the grouping into pseudo-panels as an instrumental variable procedure, with the instrumental variable estimator being the within estimator and the cohort dummies being in the role of instruments[213].

Besides being useful when true panels are not available, Deaton (1985) demonstrated that pseudo-panels have some advantages over the latter (i.e. lower impact of measurement errors and attrition, and ensuring representativeness).

Moffit (1993) also stressed interesting features of pseudo-panels, besides being useful when true longitudinal data are not available: for instance, compared to the PSID data for US "the U.S. Current Population Survey (CPS) has larger samples, more representative samples over time because they are unaffected by attrition, and more consistently-defined questions over time than the available U.S. panels. […] the analysis of RCS [Repeated cross-sectional data] data is also of interest because such data provide a connecting link between micro and aggregate data." (Moffit 1993: 100)[214].

[213] As shown in MacKenzie (2004), Verbeek and Vella (2005), and Verbeek (2007), by considering the asymptotic properties of the pseudo-panel one can estimate the model consistently by OLS, (the standard within estimator). Verbeek and Vella (2005) also highlights the equivalency between using instrumental variables (IV) with the cohort dummies as instruments in a pseudo-panel or apply OLS to the model where all variables are replaced by their cohort sample averages (Azvedo and Robles 2010).

[214] Other examples of empirical applications of the pseudo-panel method are: Browning, Deaton and Irish (1985); Banks, Blundell and Preston (1994); Attanasio and Browning (1995); Blundell, Duncan and Meghir (1998); Azzoni et al. (2000); Popper, Rees and Green (2001); Deaton and Paxson (2001); Russell and Fraas (2005) and Verbeek (2007)[214], while more recently Azvedo and Robles (2010); Bernard, Bolduc and Yameogo (2011); Barufi (2012) and Chi-Hong Tsai et al. (2014).

2.3 Empirical research

2.3.1 Causal inference studies

Nineteenth-century physician John Snow pioneered DD strategy. Snow studied the cholera epidemics in London, and demonstrated that cholera was transmitted by contaminated drinking water and not through air. He compared the death rates in two districts served by two different water companies. In 1849 both companies were getting their water supply from the Thames, but from 1952 one of the two moved the source of their water upriver to a non-contaminated area. After the company moved the death rate in the second district fell sharply, compared to the district supplied by the company which did not move.
The first discipline where DD developed was economics, where already in 1915 Obenhauer and von der Nienburg investigated the impact of the minimum wage introduction in the retail industry in Oregon, exploiting the different wage effects in Portland compared to the comparable city of Salem. Thirty years later Lester (1946) also studied the effects of minimum wages on employment in the US. Then DD started to spread to other disciplines, like in psychology with Rose (1952) who studied the effectiveness of 'mandatory mediation' on reducing work stoppages in the US. After his work scholars increasingly used policy and regulation changes for the DD design. For instance, two early pieces (Simon, 1966; Cook and Tauchen, 1982) analyzed the price elasticity of liquor sales, using state variation in liquor taxation.

More recently, the DD method has spread to the other social sciences thanks to the seminal work of Ashenfelter and Card (1985)[215] on the effect of participating in training programs on earnings of workers. A subsequent classic textbook example is Card and Krueger's (1994) paper investigating the effect of the minimum wage on employment. The authors took advantage of the minimum wage reform of April 1992 in New Jersey and compared employment rates in fast-food restaurants in February 1992 and again in November 1992. Moreover at the same time they collected the data in the same kind of firms just across the border in Eastern Pennsylvania, a state that did not pass any minimum wage change. The DD estimation compared the employment rates pre- and post- reform in New Jersey to the same difference in Pennsylvania. The idea is that since it is impossible to observe

[215] Other articles concerning the effects of training or other labor-market programs on labor-market outcomes are: Ashenfelter (1978); Heckman and Robb (1986); Heckan and Hotz (1989); Heckman et al. (1998); Blundell et al. (2004).

the counterfactual employment rate in New Jersey, had the reform not taken place, Pennsylvania serves as that counterfactual (provided that some assumptions are met).

Other papers using DD look at the effect of institutional changes or public interventions: for example, Eissa and Leibman's (1996) study of the effect of the earned-income tax credit, Meyer, Viscusi and Durbin's (1995) work on workers' compensation, and Finkelstein's (2002) study of tax subsidies and health insurance provision. More recently, Pischke (2007) studied the effect of school-term length on student performance using a reform in Germany, while Donohue and Wolfers (2005) show that there is no death-penalty abolition effect on homicide rates in the US and Canada, comparing the brief abolition period in the US and the definite abolition in Canada.

Some interesting studies have instead the peculiarity of combining the natural or quasi-experiment structure with the DD method. For instance, Hainmueller and Bechtel (2011) investigate the electoral returns of targeted policies using the 2002 Elbe floods in Germany on the vote share of the incumbent party. In a similar fashion, Montalvo (2010) studies the effect of the terrorist attacks of 2004 in Madrid on the following election results, and Imbens, Rubin and Sacerdote (2001) use lottery winners to analyze the income effect on labor supply.

Finally, in the literature there are also studies that instead of looking at differences across geographical states investigate differences across demographic groups, similarly to the designed proposed in this chapter (see Section 3 for a detailed illustration of the research design). For instance, Angrist and Evans (1999) analyze the effect of teenage pregnancies, through the change in the 1970 US state abortion laws, on educational and labor market outcomes, using both state and year of birth, while Kugler, Jimeno and Hernanz (2005) study the effect of employment protection policies in Spain across age groups.

2.3.2 Causal inference in population studies

The application of causal modeling to population studies has been quite limited. One reason is that demography, within all social sciences, is probably the discipline with the longest history and the best quality of descriptive modeling (vital rates, life tables, etc…) (Moffit 2005). A second reason is that demographic processes take a long time to significantly unfold and the variations that can be studied within the causal inference framework are usually tiny and temporary phenomena with minimal relevance in the long-run process. As Duncan (2008) puts it: "A vast gulf separates the research communities with model-based and population perspectives, and for good reason: their very bases for inference differ dramatically" (Duncan 2008: 768).

Another reason relates to the complexity and endogeneity of the processes under study. Educational, employment, partnering and childbearing decisions are all codetermined choices that depend on unobserved characteristics (i.e. preferences, ability, etc…). It is difficult to identify, even in theory, a good counterfactual in a so heterogeneous environment.

Only recently a debate has been opened in the literature on how to adapt causal inference to population studies (Fricke 2003; Smith 2003; Moffit 2003, 2005; Bhrolchàin and Dyson 2007). Following a set of symposium papers published in the Population and Development Review in September 2003, the applicability of causal modeling to demography was for the first time put on the scholars' agenda. The discussion concerns the difficult implementation of experimental models in demography and the necessity of focusing on theory and mechanisms and looking at phenomena from as many angles as possible, through comparative analysis, simulation or ethnography, to complement experiments, when they are feasible (Bhrolchàin and Dyson 2007). In their paper, Bhrolcháin and Dyson (2007) argue that demography is *already* causal, but in a less formalized way than in other social sciences. They raise the issue of the more difficult application of the principle of manipulation in the demographic framework (Zuberi 2001); they doubt the difference between the cause of an effect and the effect of a cause being meaningful and also raise the problem of confusion of different levels of the analysis (macro-micro) in the treatment-control setup. Lastly, Bhrolchàin and Dyson (2007) criticize the predominance of the regression analysis in demography, which leads to the "intellectual trap" of focusing only on variation instead of on uniformity. The same issues of non-manipulability of the many ascribed characteristics under study in demography (e.g. gender, race), of the debatable difference in causes of effects and effects of causes and the complication of the multilevel structure of experimental and quasi-experimental studies were also highlighted in the 2003 Population and Development Review symposium (Smith 2003).

Interestingly, Bhrolchàin and Dyson (2007) also illustrate some intuitive criteria of causation that serve as pointers, “more with cognitive than logical significance” (Bhrolchàin and Dyson 2007: pp. 24) in population studies. Briefly these principles are the following: time order; contiguity; duration; distinctiveness; direction; proportionality; recurrence; no cause no effect; mechanism; and no alternative (for a detailed description see Bhrolchàin and Dyson 2007: pp. 25).

Another point of view is expressed by Duncan (2008) who proposes instead to expand the use of population perspective and tools, meaning “descriptions (means, distributions, rates) and relationships (e.g., correlations) found in the population at large” (Duncan 2008: 764) to other social sciences. The author argues that causal design, as much as other observational studies can benefit from those methods. He criticizes demographic studies who abandoned population description in favor a solely regression-based approach pursued in the attempt to estimate causal models, because estimating causal effects from observational data entails two problems: the heterogeneity of the effect on population subgroups and omitted variables, and neither of the two can be solved using population data.

Duncan (2008) admits that the two issues are in most cases circumvented by causal inference designs, but he also argues that the latter, contrary to the population perspective, suffer severely from an external validity problem. The very selective nature of causal designs (natural experiments, IV, siblings FE, etc.) damage the study in terms of external validity also in those cases where population data are used: causal design studies dig into population data, identify subgroups for which there is an exogenous variation in the key variable, and sacrifice the wide population perspective to solve the heterogeneity and omitted variables problems and estimate the causal link. The author suggests that future research bring back to the population level the causal estimates identified in the subgroups.

These are some of the reasons why causal inference methodology has had limited application in fertility studies. Reviewing seven of the main journals in the discipline of demography (Demography, Population and Development Review, Journal of Population Economics, Studies in Family Planning, Demographic Research, Population Studies, European Journal of Population) I found, between 2000-2015, 59 articles claiming for some kind of causal interpretation[216]. Concerning the econometric method there are 18 Difference-in-Difference (DD) analyses, 5 combining DD and Matching, and 2 using Matching alone. Eight articles used Instrumental Variables (IV), 7 used longitudinal fixed effects models, 4 studied twins, 3 natural experiments and 3 combine DD with the synthetic control method. Finally, I also found 7 theoretical papers, one review of studies of family planning interventions, and one article using simulation to address the effect of fertility on economic growth in Nigeria.

Very few studies investigate fertility as the outcome variable in developed countries by applying a causal design strategy. Among the 59 papers, only 22 have some measures related to fertility as the

[216] Among those, 34 are published in Demography, 9 in Population and Development Review, 9 in the Journal of Population Economics, 4 in Studies in Family Planning and one in each of the other three journals, and the great majority of them have been published in the last five to six years.

dependent variable of interest[217]. Moreover, among the latter, only two of them focus on the US, four on European countries (Belgium, Austria and Germany), and three on OECD or western countries in general (Amin and Behrman 2013; Del Bono, Weber, and Winter-Ebmer 2014; Girma and Paton 2013; Klüsener, Neels, and Kreyenfeld 2013; Lechner and Wiehler 2009; Neugart and Ohlsson 2012; Trandafir 2015), while the rest of the studies concerns developing countries (Burlando 2014; Derose and Kravdal 2007; Frankenberg and Thomas 2001; Joshi and Schultz 2012; Li, Yi, and Zhang 2011; Lutalo et al. 2010; Stecklov et al. 2007; Torche 2011; Yeatman 2009. See also in other journals Breierova and Duflo, 2004; McKenzie, 2003; Stecklov et al., 2007; Todd and Wolpin, 2006).

The nine papers concerning developed countries and focusing on fertility vary in methodology and content.

Klüsener et al. (2013) analyze the impact of family policies and social norms on childlessness and total fertility, exploiting a natural experiment on German speaking territories in Belgium. The latter comprise, in fact, a German community that after World War I was ceded by Germany to Belgium, therefore being subject to family- and labor-market Belgian policies, while maintaining strong cultural ties to Germany (through language, frequent contacts, labor commuters, and mass medias). With a difference-in-difference approach the authors find that childlessness is much higher in the German territories in Belgium than in the rest of the country, while there is no difference in terms of total number of children. The first result supports a cultural bias in favor of childlessness in Germany; however the second result supports instead the relevance of the institutional and policy context in childbearing decisions.

Neugart and Ohlsson (2013) exploited a policy change to investigate the impact of monetary incentives on the timing of fertility. The authors used the German parental benefit reform implemented in 2007 to investigate how much couples are willing to postpone the timing of delivery of births to be eligible to get the economic benefits. They did find very strong evidence of working women managing to shift birth long enough to be eligible[218].

Other studies focus on the relationship between the labor market and fertility in Europe. Del Bono et al. (2014) uses firm closure as an instrumental variable for being unemployed, to disentangle the effect of unemployment and job displacement on fertility in Austria. The authors show that unemployment per se does not affect fertility decisions, but being displaced from a career-oriented job does have a negative, and long-lasting, effect on fertility rates.

In another study of Austria, Lechner (2009) investigates the gender-specific effects of active labor market programs by using propensity score matching procedure to make participants and non-participants comparable. The author finds that these labor market programs have an unintended effect

[217] DD for example, it has been applied mostly in studies of fertility-related behavior and the great majority concentrates on parental leaves reforms and their effect on children outcomes (Liu and Skans, 2010; Rasmussen 2010; Dustmass and Schonberg, 2012) or on parents' economic conditions and labor market outcomes (Ruhm, 1998; Han and Waldfogel, 2003; Rossin-Slater et al. 2013).

[218] In a different (historical) perspective, Fenge and Scheubel (2010) study in a working paper how the introduction of the Bismarck pension system – a substitute for children to elderly care – affected the historical decline of fertility.

on women's fertility, namely they reduce birthrates for participants in the program, and that this mechanism explains the men-women differences in average employment outcomes.

Concerning the US, Amin and Behrman (2013) estimate the causal effect of schooling on completed fertility, on the probability of being childless, and on age at first birth using the within-monozygotic twins methodology. The latter identification strategy allows for the control of all characteristics like genetic endowment, socioeconomic background of the family and context in which they grew up. Moreover, it also allows for the control of other unobserved characteristics shared by the twins. They find a postponement of childbearing for women with higher education, though mediated by their age at marriage.

In the other study on the US, Girma and Paton (2013) investigate the effect on teenage pregnancies of the 2003 Texas regulation requiring parental consent for state-funded birth control clinics. They exploit the county differences in the presence, or absence, of state-funded family planning clinics, and combine difference-in-difference estimation with propensity score–weighted regressions. The authors find that the requirement of parental consent led to a large decrease in attendance at family-planning clinics among teens; however, it did not lead to an increase in pregnancies[219] [220].

[219] In a similar study in the *Journal of Human Resources*, Ananat, Gruber and Levine (2007) found a permanent negative effect on complete fertility of the abortion legalization laws in the US of 1971. By comparing early-legalizing versus late and non-legalizing states for those cohorts of women affected by the law in their early childbearing years, the authors show that as a consequence of the abortion law many more women remained childless through the end of their reproductive life (they never recuperated those births).

[220] A final group of articles published in demography journals, uses the synthetic control method developed in the field of political science by Abadie, Diamond and Hainmueller (2010, 2011, 2014). Only one of them studies fertility as the outcome and it is based on Sub-Saharan Africa; the other studies are very much alike and focus on marriage rates (Abadie, Diamond, and Hainmueller 2010, 2011, 2014; Billmeier and Nannicini 2012; Cavallo et al. 2013; Dillender 2014; Karlsson and Pichler 2015; Nannicini and Billmeier 2011; Trandafir 2013, 2015).

In particular, Karlsson and Pichler (2015) analyze the consequences of HIV in Mozambique, South Africa and Zimbabwe (treatment) on mortality, life expenctancy and birth rates, using the synthetic control method to construct the artifical control group. They found large causal effects of HIV on mortality and life expecatncy in South Africa and Zimbabwe, while surprisigly small effects in Mozambique. They also found no effect on births in any of the three countries.

Trandafir (2015) examined the effect on different-sex family formation (marriage, divorce, and extramarital births) of the legal recognition of same-sex couples on OECD countries in the period 1980–2009. The paper combines the difference-in-difference estimation technique, exploiting the country differences in the type and timing of the legal recognition of same-sex couples, and the synthetic control method, used to construct additional counterfactuals. Results indicate that the introduction of same-sex marriage, or of alternative institutions, has no negative effects on different-sex family formation. In a precedent-making paper (Trandafir, 2013) the author found the same results in the Netherlands.

Finally, another very similar study was conducted in the United States (Dillender, 2014) on the impact of changes in same-sex couples' legal recognition laws (1995-2010) on marriage rates. Using a difference-in-differences strategy, Dillender (2014) also found no evidence of reduction in the opposite-sex marriage rate by allowing same-sex marriages.

2.3.3 Studies combining DD and pseudo-cohorts

The only recent study I found analyzing pseudo-panels' fertility is that by Currie and Schwandt (2014). Very interestingly, they also investigate the effect of economic shocks to fertility; in particular they address the short- and long-term births' response to unemployment rates in pseudo-cohorts of American women. They find a negative overall effect of -0.5 conceptions per 1000 women for a 1% rise in unemployment. Younger women's fertility is more sensitive to unemployment compared to that of older women (up to finding no effect for women around 40 years old). A 1% increase in unemployment rate experienced around age 20-24 old reduces conceptions in the same age group (the authors define this as the short-term effect) of about 6 births per 1000 women, but reduces completed fertility of these women (always experiencing the rise in unemployment in their twenties) at 40 years old of about 14 conceptions per 1000 women[221].

More in general, to my knowledge there are very few papers combining, as done in the present study, the two approaches of DD and pseudo-panels and there is just one that has fertility as the outcome variable under study.

Gahzal Naz (2004) combines synthetic cohorts and DD, investigating the impact of cash-benefit reforms in Norway on parents' labor-force participation and couple specialization. In a subsequent paper (Gahzal Naz, 2010) compares the effect of the same Norwegian reform on the labor supply and earnings of cohorts of native and immigrant women.

McKenzie (2003) analyzes family strategies, among which is fertility choices, to cope with the Mexican peso crisis of the mid-nineties using DD applied to pseudo-panels. Comparing the mean average number of children under the age of two, in different pseudo-cohorts, in the periods 1994/96 (births conceived before the onset of the crisis) versus 1996/98 (births conceived after the onset of the recession). The author finds that 5% of the households with a head aged 20-34 decided to postpone or renounce to childbearing during the period of the crisis (even though results are statistically not significant, due to sample sizes, according to the author). This paper is very interesting, since the process under study resembles quite closely the one proposed in this chapter, even though the fertility context is completely different in terms of historical period and the country under analysis. Also the outcome variable is not the same: McKenzie (2003) studies the effects of the Mexican crisis on the intensive margin of fertility, i.e. the total number of children, instead what I study here are the consequences of the Great Recession for the extensive margin of fertility, i.e. childlessness.

[221]To my knowledge at the moment of writing there are no other empirical works applying the pseudo-panel approach specifically to fertility issues. The only exception is the unpublished work *Pseudo-panel analysis of fertility in Zimbabwe* by Mencarini and Drovandi, unpublished.

2.4 Childlessness in the United States

As delayed childbearing is more and more a typical phenomenon in the US, as in other developed countries, births to older women are becoming a key point to understand the dynamics of fertility and the changing population structure. According to the US National vital statistics (CDC/NCHS) *first birth* rates for women aged 35–39 started to increase in the mid-1970s and rose six-fold from 1973 to 2006, then slightly declined from 2006 to 2010 (from 10.9 to 10.4 per 1,000 women) and increased again to 11.2 in 2013.[222]

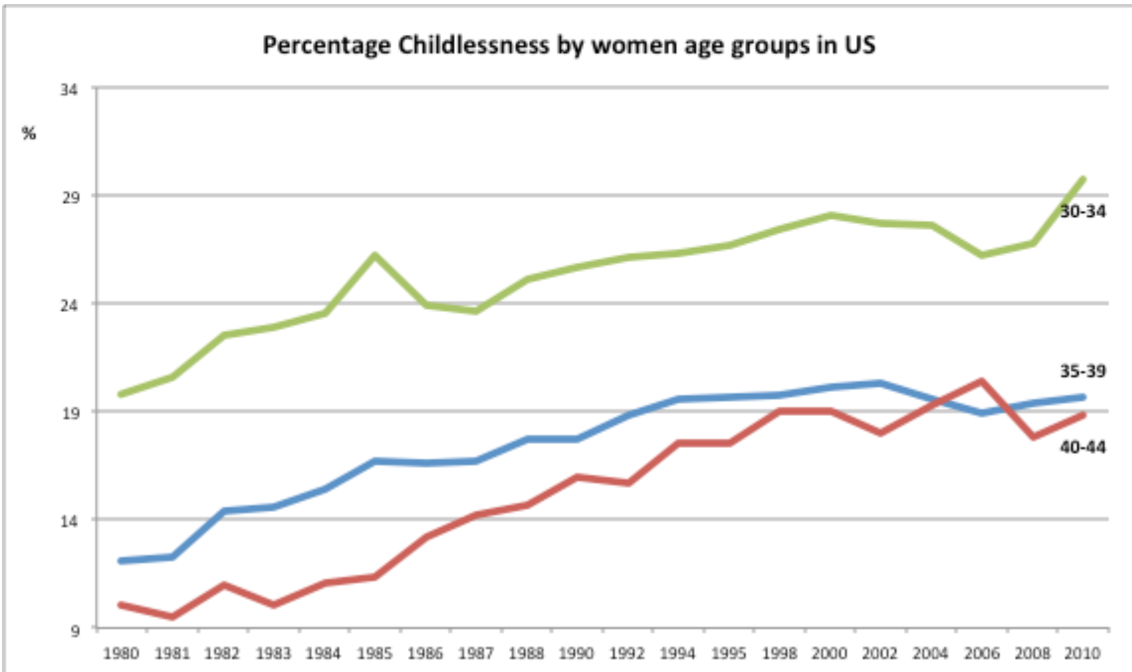
The first birth rate of women 40–44, essentially stable during the 1970s and early 1980s, though remaining very low increased four-fold from 1985 through 2007 (from 0.5 to 2). Since then it has been stable around 2.2-2.3 (per 1,000 women). These trends are common to all races and to all US states.

As women postpone births, also the proportion of them remaining childless inevitably increases. As shown in Figure 5.2, in 1980, only 10% of women did not have children by the age of 40-44, while this percentage has grown to 19% in 2000 (CPS) but in the same period for women in the age range of 35-39 childlessness similarly increased from 12% to around 20%, meaning that not a lot happened after 40 years old.

During the first years of the 2000s, though, the postponed births of the nineties started to be recuperated and together with rising birth rates, declining childlessness was registered, among all women in their thirties, and right before the onset of the recession also for women in the age group 40-44. But after 2008 this decline halted and childlessness increased in all age groups, though more substantially for the younger group of women aged 30-34 and only mildly for the age group of our interest, the 35-39 year-old women (Figure 5.2). We thus expect to find a positive, but *weak*, effect of the crisis on childlessness rates of women in their late thirties.

[222] Data available at http://www.cdc.gov/nchs/data/databriefs/db152.htm

Figure 5.2: Rate of childlessness by women age group (1980-2010).



Source: Elaboration of the author based on CPS data (Current Population Report).

Even though the *intensive* and *extensive* margins of fertility are often analyzed together in the literature, they represent two separate concepts and, more importantly, they signal and portray very different individual life choices. In economics the intensive margin is defined as the degree (intensity) to which a resource is utilized or applied. In our case that means the cumulative fertility (assumed strictly positive); in other words, given that a woman has children, how many does she have? In contrast, the extensive margin is the range to which a resource is utilized or applied (0,1), which translates in our framework as the choice of remaining childlessness or not.

It is important to distinguish between the two margins for many reasons (Baudin et al. 2015). First of all, their historical trends: across different generations the correlation between childlessness and total fertility can be positive or negative, but in the long run the relationship is surprisingly positive. Historically, childlessness first decreased than increased: the initial decline was due to the general decline in poverty (with a decrease in social sterility) but then childlessness increased again due to the increase in opportunity cost of childbearing. Fertility of mothers, instead, showed a constant declining trend over time.

Second, there are large differences across countries: some have high completed fertility and low childlessness (e.g. France and Sweden that have similar fertility rates of mothers compared to the US but much lower childlessness than in the US), while in some other countries (e.g. Austria, Belgium and Denmark) childlessness is lower than in US but also completed fertility is lower than in the US.

Finally, the profile of the two margins across educational levels varies a lot, and subtend to very different mechanisms. Fertility of mothers generally declines with education, but between education and childlessness there is a U-shaped relationship: on the one hand, low-educated (and also low-income) women are sterile (2.5% of American women) – meaning that they suffer high childlessness rates due to consumption constraints. On the other hand, highly educated women register also higher childlessness rates but because of the larger opportunity cost of children (8.1% of American women) (Baudin et al. 2015).

A 2010 report of the Pew Research Center (Livingston and Cohn 2010) investigates the trends in childlessness in the US across educational levels. They measure childlessness at 40-44 years old from the June supplement of the Current Population Survey (pooled data 2006-2008) and find a general increase in childlessness. While declining for more educated and White women, however, the increase is driven by low-educated women and other racial groups. For instance, in the period 2006-2008, 24% of women aged 40-44 with a bachelor's degree, 25% of women with a master's degree and 23% of those with a doctorate or a professional degree did not have a child. In contrast, childlessness rates for the same groups of women in 1992-94 were much more diverse: respectively 23% (bachelor's), 30% (master's) and 34% (doctorate). Looking at less-educated women the same process of increasing similarity is evident. In 2008, 18% of women with some college (but no degree) were childless, compared to the 17% of high school graduates and the 15% of women without a high school diploma. Those rates in 1992-94 were instead respectively 15%-13% and 9%. Today clearly the gap between women with bachelor's degree and a PhD has disappeared, as it has almost disappeared between very-low-educated women and those with some college. Also, if at the beginning of the nineties the difference in childlessness rates between tertiary-educated women and very-low-educated women was more than 20%, the same gap in 2008 was less than 10%.

Besides educational levels, also marital status and ethnicity are determinant for childlessness (Bachu 1999). At the end of the nineties among the women with a high-school diploma, 11.2% of those who have been married are without kids at 40-44, compared to the 43.3% of never-married women. The difference is even larger at higher education levels: among women with a graduate or professional degree, at age 40-44, the 22.6% of those married is childless, compared to the 95.6% of their unmarried counterparts (Ray et al. 2014).

Being married is still a strong precondition to motherhood for White non-Hispanic American women: 69.5% of the unmarried are childless (same among unmarried Asian women: 65.8%), compared to African American unmarried women of which less than a third (27.8%) do not have children by the age of 40-44, and 36.4% of Hispanics (US Census Bureau 2011, Roy et al. 2014)[223].

[223] This pattern is very different for instance with respect to Northern European countries where a sizable proportion of births are out-of-wedlock.

The group of *voluntary*[224] childless women at an advanced age is a very peculiar one. As, for instance, Abma and Martinez (2006) put it: "childless women nearing the end of their reproductive life span are unique because they have had considerable time to invest in domains other than parenthood" (Abma and Martinez 2006: pp. 1045). Women reaching age 35-40 years without children have probably been focused on their educational- and labor-market career and might have very different preferences compared to mothers.

The increasing rates of voluntary childlessness signal societal changes in individuals' behavior that are clear also in the motivations, given in interviews, for voluntary renunciation to parenthood: the dislike of children, the protection of the couple's intimate relation, the career or other financial restrictions, a strong privacy orientation and socialization experience.

The diffusion of childlessness is also favored by the change in attitudes toward childless couples, strongly stigmatized as selfish in the past but less and less so today, especially among highly educated young cohorts (Roy et al. 2014). Nonetheless, empirical findings do not find a very large difference in attitudes between childless and parents (Hakim 2003, 2005).

The sociological literature on childlessness and its determinants has a long-standing record and it is arduous to globally frame it because of the many theoretical 'nuanced, quasi-philosophical' (Basten 2009: 9) concepts associated with the question of why women do not have children, such as preferences and life-styles, gender roles, feminism and so on.

A debate within the sociological literature, though, refers to the issue of voluntary childlessness I just introduced. The discussion refer to the sharp division frequently seen in the literature between women who are childless-by-choice (child-free) because they do not want babies, and the childless-by-circumstances women who planned to have offspring but due to some (e.g. medical, economic or partnership-related) obstacles have renounced motherhood (Basten 2009; Tanturri and Mencarini 2008).

However, framing childlessness as an always-conscious, totally voluntary, choice might be misleading, as apart from a very small group of 'early-deciders', the majority of these women end up childless without having exactly planned it. Empirical evidence shows that preferences change over time and that, for instance, women who planned to have children might get used to their life style as childless and might be unwilling to change it. Thus they revise their original decision and renounce the idea of becoming mothers (Morgan 1991). In contrast, among the child-free women there are those who are very decided and those who are uncertain about childlessness, with a varying degree of uncertainty (Hakim 2005).

In a more dynamic vision of life-course choices, women are often childless as a result of the continuous postponement of motherhood (Keizer, Dykstra, and Jansen 2008; Mynarska et al. 2013;

[224] Voluntary childlessness has been defined as the couple's choice of not to have children and their participation in taking anti-conceptive measures to ensure they do not conceive a child (Roy et al., 2014: pp. 53).

Craig et al. 2014). Being childless is not a one-time and definite decision; it is more the end of a process involving choices in other domains of life (partnering, education, or employment) (Campbell 1985; Hakim 2000). Childlessness should be situated in time and space – across life dimensions – and seen as the result of cumulative decisions from previous experiences[225]. It might therefore be better to talk about 'remaining childless' in the sense of childlessness being the outcome of never having made the decision to become a parent.

A final aspect to consider is the individual *ability* to predict how far a woman can allow herself to postpone childbearing. Some women can anticipate their capability of delaying motherhood to an older age (for instance because they are more educated or they can afford better health care) and because of this, they might be more likely to do so. Other women might instead not be able to anticipate whether they can postpone childbearing or not, and therefore they might be more likely to have their children early, even if the external conditions are less than ideal. As Craig et al. (2014) reported, among women who turned 45 in 2006, 20% were childless. This has been called the 'generation of childless women', even though they are not women who do not want a child; mostly, they end up with no kids because they overestimate their possibility of postponing childbearing (underestimating their biological limits of fertility or the availability of potential fathers).

As a matter of fact women tend to underestimate the age effect on the possibility of conceiving: *involuntary*[226] childlessness is particularly acute for highly educated women in the US, who also usually overestimate the effectiveness, and underestimate the costs, of Assisted Reproductive Technology (ART) or Artificial Insemination (ATI). The probability of conceiving naturally after 40 years old is only 2% and pregnancy after 45 is very uncommon. Moreover, more than 10% of women in the US (and 7.5% of men) have infertility problems (CDC 2012). The most frequent users of ART are, in fact, 35-44 year-old women (52% of all users) who are being treated for "diminished ovarian reserve" rather than for a natural inability to give births. The ART is very time-intensive and physically demanding; it is also very expensive[227] and rarely covered by state health insurance plans.

[225] Cumulative contingencies and linked lives as defined by Mynarska et al. 2013, pp. 3.
[226] Infertility is defined as the inability to conceive a child after one year of having unprotected intercourse, restricted to a period of six months if the woman is over the age of 35 (CDC 2012). Being involuntarily childless is the social condition coupled with this biological definition (Roy et al. 2014).
[227] Their cost ranges from 1000$ for medications to 50000$ for multiple cycles of ovarian stimulation and embryo in vitro fertilization (Craig et al., 2014; Bouwmans et al., 2008).

3. The Data and Research Design

3.1 Measuring childlessness in the ACS and CPS Fertility Supplement

As mentioned, the way I test the existence of a causal relationship between the economic crisis and the renunciation of motherhood is to follow identical groups of women across time. As required by pseudo-panel studies, women are grouped together according to time-invariant characteristics, i.e. year of birth and race, and the analysis concentrates on childless women at the end of their reproductive lives, around the age of 40, to capture part of the permanent effect of the crisis – at the margin – on fertility. These, in fact, are the women for whom a postponement of motherhood might very likely mean forgoing birth.

There are conceptual and technical reasons for measuring definite childlessness at 39, earlier than what is usually done in the fertility literature (at 44 years old).

First of all, according to studies on childbearing at older ages in the US, the proportion of voluntary childless women doesn't change much between 35-39 years old and 40-44 (in 2002, 41 versus 44%). Moreover, the great majority of women who declare themselves at age 35-39 to be temporarily childless, and declare they want children in the future, become involuntarily childless (are not able to actually postpone childbearing) at age 40-44 (Abma and Martinez 2006). As already mentioned, Craig et al. (2014) also writes that the odds of conceiving naturally after 40 years old are only 2% and pregnancy after 45 is uncommon. Costs are also not within everyone's reach, ranging from 1000$ for medications to 50000$ for multiple cycles of ovarian stimulation and embryo in vitro fertilization (Craig et al., 2014; Bouwmans et al., 2008). This evidence shows that we can quite robustly measure definite voluntary childless around the age of 40.

The second reason for measuring childlessness at 39 is technical and related to the data. But before clarifying this, it is necessary to describe the data at our disposal for this study. Our DD and pseudo-panels design requires large N samples to avoid random fluctuations in the variable of interest from one year to the next. To ensure a large enough sample and exploit the geographical information richness, US census data have been chosen to carry out the analysis. Among US census data, there are, in particular, two suitable options: the American Community Survey (ACS) and the June Fertility

Supplement of the Current Population Survey (CPS)[228] gathered through the Integrated Public Use Micro-data Series (IPUMS_USA)[229].

The former (ACS) is a component of the reengineered Census designed to give more timely information with respect to the decennial long form census. Every year since 2000 a sample of 3 million addresses is drawn from the Census Bureau's Master Address File (MAF) producing a sample of about 2.5% of the US population, from geographic areas with population larger than 65000[230]. The average number of family units actually interviewed each year is 2 million.

The ACS is roughly 40 times larger than the Current Population Survey (CPS), a monthly labor survey of around 55000 households. ACS estimates are based on 12 independent monthly surveys per year; they are period estimates and have to be interpreted as the average values over the whole year in which information was collected.

The CPS is the primary source of official government statistics on employment and unemployment, but it also collects demographic information and includes monthly supplements on special issues. The June CPS Supplement on Fertility[231] is a biannual special questionnaire offered to the 15-44 year-old female members of the households. All waves of the CPS between 1998 and 2010 are also downloaded from IPUMS, which harmonizes all variables.[232]

On the one hand, the ACS is better than the CPS in terms of sample size, geographical and yearly coverage, and year-to-year comparability.[233] [234] However, the former suffers from imprecision (measurement error) in the fertility (dependent) variable. The way the question is posed on the number of (biological) children in two questionnaires is the following: the June CPS asks if women have *ever had children* while the ACS asks about the number of *children residing in the household*. The latter thus excludes children (supposedly older than 18 years of age) who live at college or just moved out, and those children who do not reside in the same household of the mother – if divorced or separated (they live with the custodial father)[235].

Since I am working with differences, the exclusion of these two groups might invalidate the analysis only if the proportion of children not residing with the mother had changed during the recession period between 2007-2010, thus making the dependent variable in the treatment group differ in some way from the control group. If, for instance, college participation increased due to the crisis after 2007 and,

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228 For a detailed description of the two samples see www.census.gov.

229 Steven Ruggles, J. Trent Alexander, Katie Genadek, Ronald Goeken, Matthew B. Schroeder, and Matthew Sobek. *Integrated Public Use Microdata Series: Version 5.0* [Machine-readable database]. Minneapolis: University of Minnesota, 2010.

230 For less-populated areas the sample must be accumulated over a number of years. The Census Bureau produces 3-year estimates for areas with 20000 individuals or more, and 5-year estimates for all geographic areas.

231 Another special issue is the CPS March Social and Economic Supplement.

232 The last wave of June 2012 was not yet available via IPUMS so I downloaded the non-integrated version available through the National Bureau of Economic Research (NBER). Data from http://www.nber.org/data/cps_progs.html together with the Stata dictionary at http://www.nber.org/data/progs/cps/cpsjun2012.dct as suggested by Joe Grover at the Minnesota Population Center.

233 And also CPS surveys are less comparable across waves. For instance, in the wave of 2012 the sample of women who received the supplementary questionnaire was expanded from 15-44 year-old women to 15-50 year-old women, to match the age range of women answering the ACS survey (See Fertility of Women in the US: 2012 Report at http://www.census.gov/content/dam/Census/library/publications/2014/demo/p20-575.pdf).

234 This very likely is the reason why the proportion of women without children drops substantially in the 2012 wave (and there is a discrepancy with the ACS). Another reason is mentioned in the official report delivered by the US Census Bureau (See Figure 2 in the Fertility of Women in the US: 2012 Report at http://www.census.gov/content/dam/Census/library/publications/2014/demo/p20-575.pdf) where this pattern in the CPS data is partly explained as due to a recalculation of weights for the CPS June Fertility supplement, in fact: the weights for the year 2000 are based on the decennial census of 1990, weights between 2002 and 2010 are based on the 2000 decennial census and the June CPS of 2012 is weight-based on the decennial 2010 census.

235 Does not include, however, women's stepchildren, because the question asks about *own biological children* only.

also, these students were more likely to live on campus, among the women declaring themselves to be childless the proportion of those who actually have a child but he/she lives on campus would be higher in the treatment group. In this case we would be overestimating the positive effect of the recession on childlessness. The same is true if the crisis led to an increase in the proportion of children living with custodial fathers.

One first way to exclude possible bias in the estimates is to check the trends in the proportion of students leaving home for college and of children residing with the custodial father.

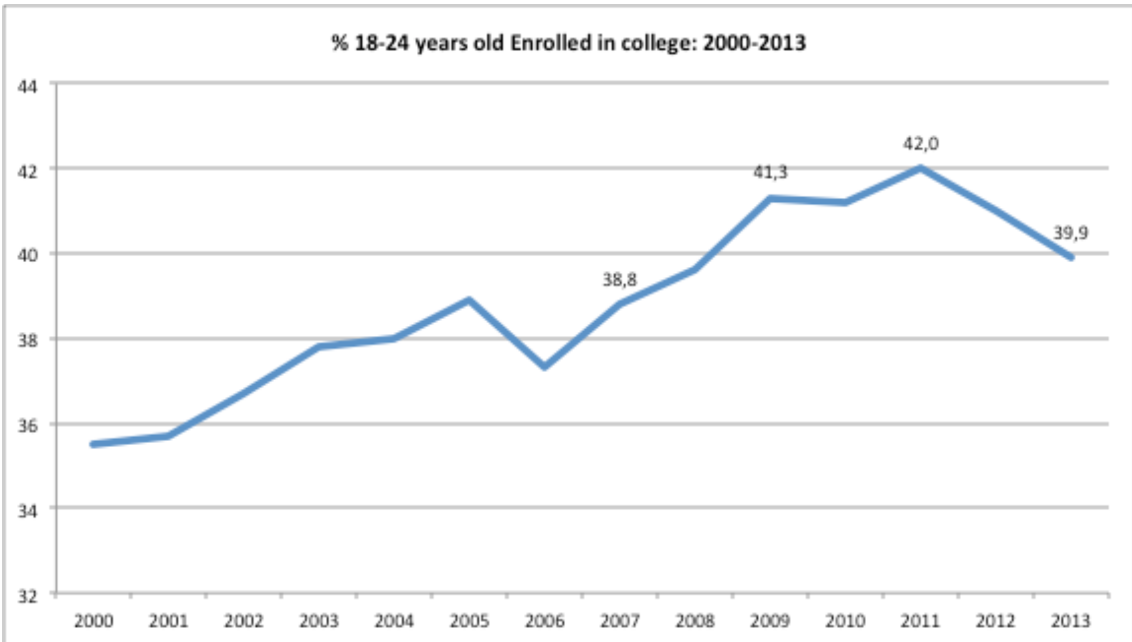
According to the US Census Bureau the percentage of Millennials[236] between 18 and 31 years of age living with their parents has been steadily increasing in the last years: it was 32% in 2007 before the onset of the recession, 34% in 2009 and 36% in 2012 (Census CPS) – these percentages, however, include children who live in colleges as they were still residing with the family, and the latter group comprises at least a third of them. If the proportion of children moving to college has increased during the recession these numbers might overestimate the phenomenon.

Data on college enrollment show (Figure 5.3) an initial increase of young adults age 18-24 enrolled in college, from 38.8% in 2007 to 41.3% in 2009, peaking at 42% in 2011 (Census CPS). Since then the proportion has been declining, reaching almost pre-crisis levels. But among these, how many moved out of the family home to go to college? Did this proportion change during the recession? It is more difficult to answer these questions since the percentages vary a lot across states, types of college and family characteristics. For instance, a recent (2014) report by Sallie Mae[237] show that among first-generation college attendants, 72% live at home, while for second-generation attendants the proportion is only 47%. Nonetheless, it is clear from the report that keeping children at home is a considered as a saving strategy for families to afford children's college enrollment: more than 50% of the parents strongly agree with this statement. Moreover, other estimates (Census CPS) show that the proportion of individuals moving for college, among total movers, having been roughly stable around 2-3% until 2010-2011, dropped significantly to around 0.5% in 2011-2012 and 2012-2013 (Figure 5.4).

[236] See footnote # 83 in Chapter I.

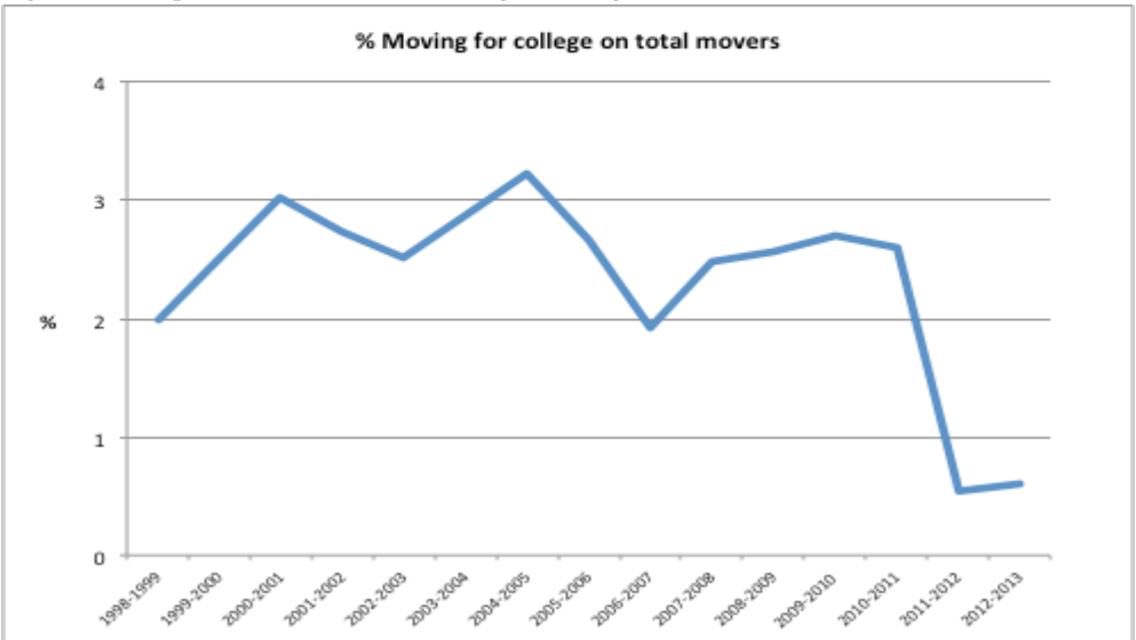
[237] Sallie Mae, 2014, "How America pays for college". Sallie Mae is the US largest corporation collecting, organizing and financing students' debt. The report is available at: http://news.salliemae.com/files/doc_library/file/HowAmericaPaysforCollege2014FNL.pdf

Figure 5.3: Proportion of young adults 18-24 enrolled in college (2000-2013)



Source: Elaboration of the author based on CPS data (Current Population Report).

Figure 5.4: Proportion of individuals moving for college on total movers (1998-2013)

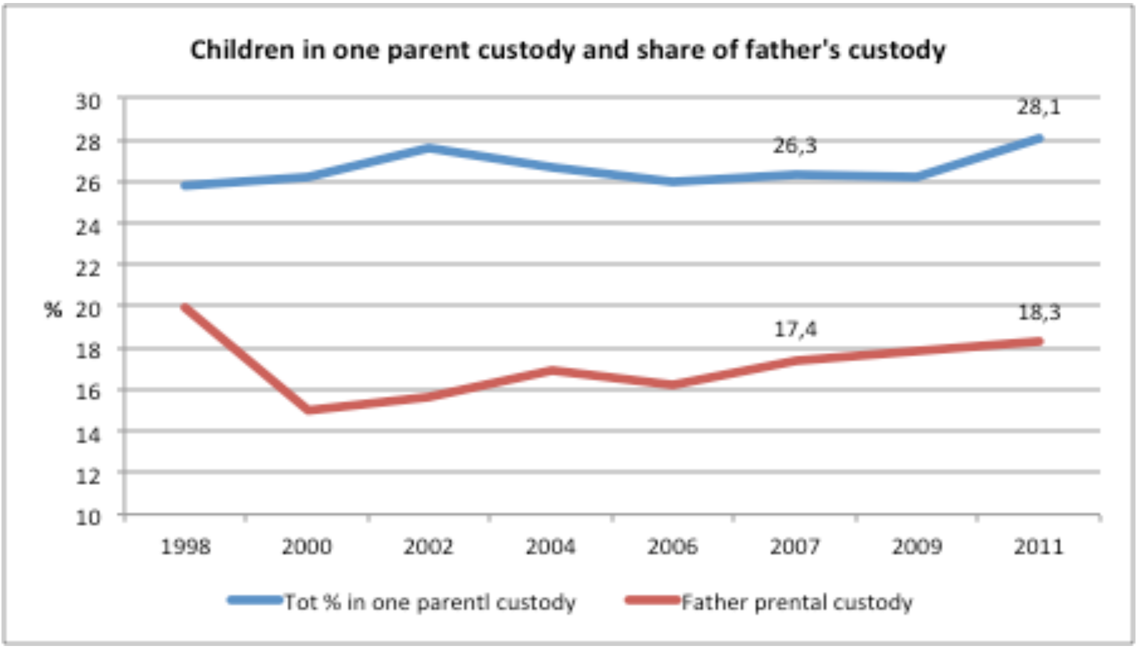


Source: Elaboration of the author based on Sallie Mae Report 2014.

Despite the increase between 2007 and 2011of around a half-percentage point, the proportion of the movers for college was never larger in 2007-2011 than in the pre-crisis period, and also the parallel increase during the crisis in college enrollment was much bigger (+4%). Moreover, the recession should have theoretically the opposite effect – as the evidence from the Sallie Mae report confirms – namely that students tend to choose to attend a college closer to their parental home, so as to keep living with them and thus save money.

As far as children in custody is concerned, the percentage of them living with only one parent increased by around 2% between 2009 and 2011, but among them, the proportion of those that reside with the father has been quite stable in the last 10 years, to around one out of six (Census CPS). During the recession years, in particular, it changed from 17.4% to 18.3%, a negligible increase (Figure 5.5). In conclusion I do not expect the issues of college attendance and of fathers' custody to play a large role in the analysis and to bias the estimates.

Figure 5.5: Proportion of children in fathers' custody (1998-2011)

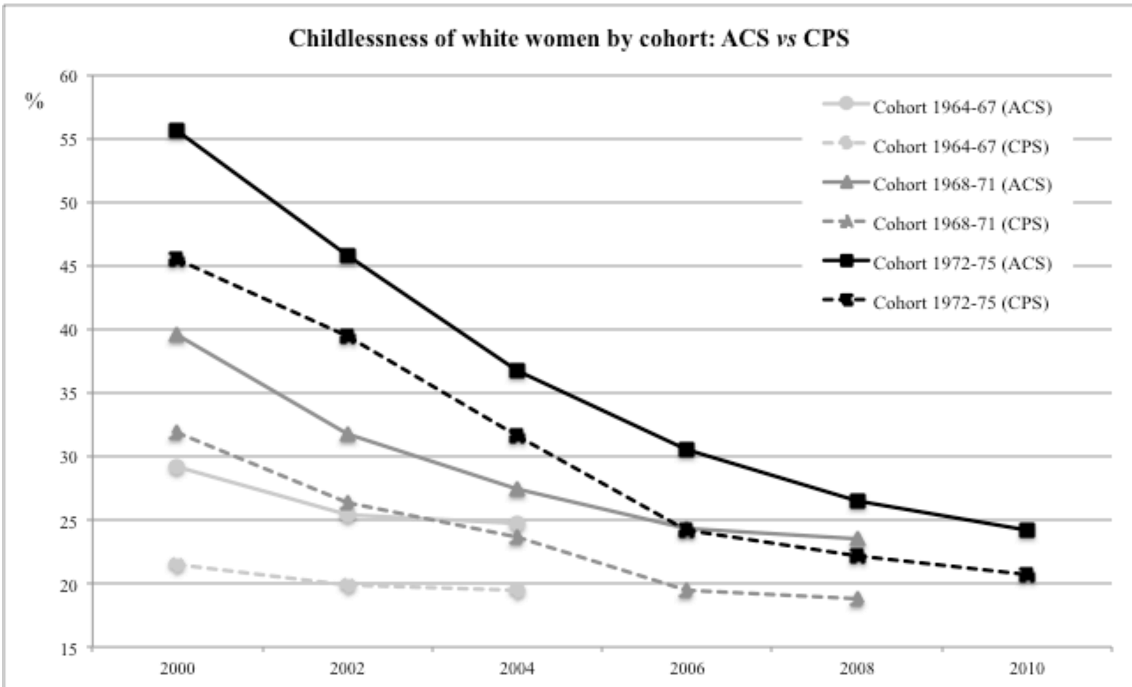


Source: Elaboration of the author based on CPS data (Current Population Report).

A second way to get a sense of how big the problem of the ACS question is for the analysis, is to compare the percentage of childless White women in some ACS cohorts, with that in the same cohorts in the biannual June CPS. If the difference is not too large and, more importantly, it is stable over time, the analysis could be performed as well with ACS, without damaging the estimates. Because the empirical model works with differences over time (DD), the absolute proportion of childless women is not relevant, as long as the number of children living in the household is, over time, a good proxy of the number of children women have.

The results from three cohorts (born between 1964 and 1975) are plotted in Figure 5.6 for each of the biennial June CPS waves and the corresponding in the ACS. Even though the straight (ACS) and dotted (CPS fertility supplement) lines are distant they seems nonetheless parallel. We can attribute the roughly 5% systematic difference between the two samples to women who had children in the ACS sample but who do not live in the same residential unit with them. Again, since I will be dealing with differences it does not matter if the proportion is not exactly the same, as long as the bias is systematically the same in all waves, as it appears to be. The analysis then can be conducted safely on both samples and both should yield the same results.

Figure 5.6: Proportion of childlessness by cohort in ACS and CPS (2000-2010)



Source: Elaboration of the author based on ACS and CPS June Fertility Supplement.

The last precaution links back to the issue of measuring childlessness (complete fertility) at 39 years of age instead of 44, mentioned at the beginning of this section. Because of the way the question on fertility is posed in the ACS data, the older the women are the higher the probability that they actually had children but they do not reside with the mother anymore. To reduce at the minimum the potential measurement error and since evidence suggests pregnancy at age 40 and over is not very common, I decided to pick women of 39 years-old maximum. The latter choice should not come at a large cost since, as mentioned before, first births to women older than age 40 have been stable after the recession, around 2.3 (CDC/NCHS), meaning that if women around age 37-39 postponed childbearing during the crisis, there is no evidence that those births were recuperated after 2010. We can be thus pretty confident that a possible increase in the proportion of childless women at age 39 by 2010 closely approximates the number of foregone births due to the Great Recession.

3.2 The identification strategy in the difference-in-difference (DD) design

Identification in the case of fertility decisions and how they change according to particular economic conditions is complex because, as mentioned, there are unobserved variables that affect both treatment and outcome. For instance, there might be some hidden characteristics (family preferences, ability, attitudes towards commitment, etc.) that jointly determine the sector in which a woman works and the decision to have children or not, and that specific sector might as well be more or less strongly hit by the recession. As these group traits are unobserved, it is unlikely that researchers can actually address this endogeneity by simply adding further covariates in the traditional regression framework.
Moreover, the identification of an effect is made burdensome by the fact that it is extremely hard to find an appropriate control group. As also described in the previous chapters, the economic and financial crisis has spread all over western 'comparable' countries, and within the US over all states, which makes it arduous to find two comparable groups of individuals, one hit by the crisis and the other not.
The solution adopted in this chapter is to compare groups of women, not across space, as is usually done, but across time, identifying the causal effect of the Great Recession on childlessness via a DD approach, applied to pseudo-panels of American non-Hispanic White women. Specifically, our treatment and control groups of women differ with regard to the time period in which they turn a specific age. We focus on childless women in their late thirties and differentiate between the treated women, who spent some crucial years of their reproductive life during the Great Recession, and the control women who spent the same years just before the onset of the crisis. This design can be described as 'treatment at a specific age with pseudo-cohorts'[238] and it can be applied to estimate the postponement effect of the recession on fertility at any age. We focus, however, on women close to the end of their reproductive life for whom postponing their first birth likely means renouncing motherhood. We define as crucial years for women's fertility the age range between 34 and 39 because a postponement of childbearing at that age is more likely to slide into a reduction in completed fertility.

Equation 2 in Section 2.1.2 illustrates that the DD causal estimate is, in fact, a difference between two differences. The DD estimate is the difference between the treatment (T) and the control (C) groups in the variation of the outcome Y over time (0,1) within group. In other words, it cancels out within group differences in the outcome over time (within group time trends) and then it makes the cross-group difference of those first differences (cancelling out any pre-treatment systematic difference between the groups). More specifically in the case presented here, in Eq. 2, Y is the

[238] In a different context, Dinas and Stoker (2014) define a similar design as 'at a single point in the life cycle'.

proportion of childless women; the upper numbers 0 and 1 refer respectively to age 34-36 and age 37-39, while the lower letters T and C to the treatment and control group. The control group is given by childless women who turned age 34-36 in 2004, while the treatment group is given by childless women who turned age 34-36 in 2007. The resulting effect ($\hat{\delta}_{DD}$ in Eq. 2) is entirely attributed to the treatment and in our case it expresses the causal estimate of the average treatment effect of the Great Recession on childlessness rates of women close to their forties.

As already mentioned, for this effect to be identified, the DD method relies on the parallel trend assumption: in the absence of the treatment, the outcome paths of the two groups should not be systematically different. This means that *in the absence of the Great Recession* (treatment) the rate of childlessness is determined by the sum of a fixed, time constant, group-specific effect and a time-specific effect common to both groups. This is essential in DD since, in practice, the pre-treatment trend is extrapolated into the post-treatment period as a counterfactual. Ideally, the more past time points are available, the more you can convincingly prove the parallel trend assumption.

First of all, consider Figure 5.7, which illustrates the pseudo-panel schema and the cohorts selected in the case of the ACS sample. White Caucasian non-institutionalized[239] women are grouped according to their year of birth so that treatment and control groups of women differ with regard to the time period at which they turn a specific age. Women in the treatment group *(T)* are born between 1971 and 1973, so that they turn age 34-36 in 2007 and they spend the years close to the end of their reproductive life during the Great Recession, which starts in December 2007[240]. Women belonging to the 1968-70 pseudo-cohort form instead our control group *(C)*: they are 34-36 years old in 2004, meaning that they spend the same period close to the end of their reproductive life *just before* the onset of the crisis[241]. Childlessness is measured for both groups, as the probability of a woman of a specific cohort of being childless in a given year.

[239] I excluded from the sample women living in Group Quarters, meaning institutions, for two reasons: first, they represent a very special case and, second, because they are excluded from the ACS survey waves 2000-2005.
[240] US National Bureau of Economic Research (NBER).
[241] Groups are, in fact, pseudo birth cohorts.

Figure 5.7: Pseudo-Panel schema in ACS survey

Birth Cohort	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Group
1965	36	37	38	39							
1966	35	36	37	38							**P**
1967	34	35	36	37							
1968				36	37	38	39				
1969				35	36	37	38				**C**
1970				34	35	36	37				
1971							36	37	38	39	
1972							35	36	37	38	**T**
1973							34	35	36	37	

Source: Elaboration of the author.

The cohorts and years on which the analysis on ACS data is focused are illustrated in Table 5.1 together with sample sizes. The reason why in 2001-2004 the placebo and control groups have a significant smaller sample size is that the ACS survey's size increased over time: in 2000 it was only of 1/750 of the US population, then between 2001 and 2004 it was around 0.4% of the population and only since 2005 it is 1%.

Table 5.1: Pseudo-Panels size in the ACS

Cohort		2001	2004	2007	2010	*Tot.*
1965-67	**P**	20283	19976			*40259*
1968-70	**C**		19141	44764		*63905*
1971-73	**T**			43006	43385	*86391*
Tot.		*20283*	*39117*	*87770*	*43385*	*190555*

Source: Elaboration of the author based on ACS data.

Within the regression framework, the model is illustrated in Eq. 4 (the analogous of Eq. 3 in Section 2.1.2). The variable *Age37-39* is a dummy for being age 37-39, which refers to the year 2010 for the treatment group and for the year 2007 for the control group. The variable *Treatment* is a dummy for being born in the birth cohort 1971-73. The probability of the woman i in the cohort c of being childless depends on her age and her birth cohort, which together determine whether this woman spent her late thirties during the Great Recession or before. The interaction coefficient δ_{DD} tells us what is the causal effect of being 34-39 during the crisis, on the probability of still being childless at 37-39 years old. X is a vector of additional observable determinants of childlessness added both to check the robustness of the results and to test the possible mechanisms through which the recession might affect childlessness[242].

[242] State fixed effect, educational attainment, marital status and employment status.

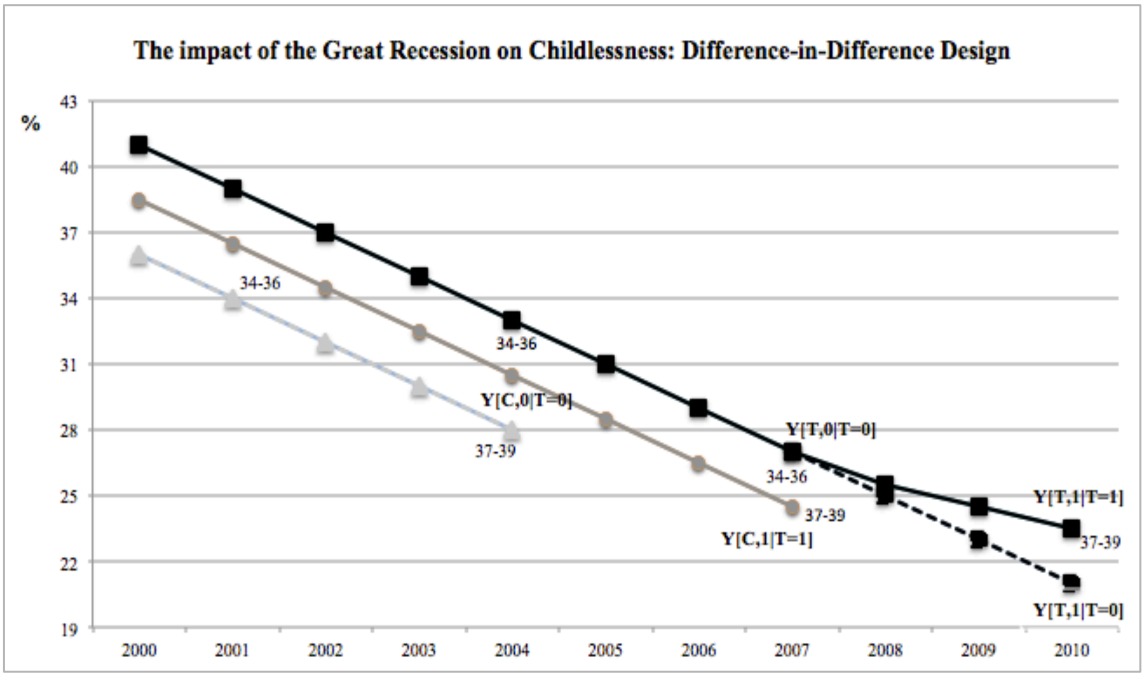
$$\Pr(Childless)_{i,c,t} = \alpha + \beta_1 Age37-39_{i,t} + \beta_2 Treat_c + \delta_{DD}(Age37-39_{i,t} * Treat_c) + X_{i,t} + \varepsilon_{i,t} \qquad (4)$$

To ensure the soundness of our DD design, first I test whether the parallel trend assumption is met. Second, I present descriptive statistics comparing the distribution of key variables across the treatment and control cohorts to show that they do not differ significantly in the main determinants of fertility. Finally, I introduce a random placebo treatment in 2004 in the following way: the group in the upper part of Figure 5.7 is the placebo pseudo-cohort *(P)* of women born in 1965-67 who, exactly like the control group, spend between age 34 and 39 in a non-recession period. If the research design and the assumptions for the identification of the model are correct, replicating the DD analysis between the control and the placebo group should show no effect.

Figure 5.8 illustrates graphically (fictitious data) the research design, which is slightly different from the typical difference-in-difference analysis. As mentioned, our design could be defined as a 'treatment at a specific age with pseudo-cohorts' since we compare women who entered their last years of reproductive life at the onset of the economic crisis, with women who spent the same years just before the recession.

Each line in Figure 5.8 represents one of the pseudo-cohorts selected: the black line is the treatment, the dark grey line with circles is the control and the light grey line represents the placebo. The Y-axis shows the percentage of women without children in each group. First, the lines are downward sloping because we expect the proportion of childless women in each cohort to decline over time, since some of those women with time would have had children. Second, if the assumption of parallel trends holds, we expect these negatively sloped lines to be parallel, separated because of fixed cohort effects, but parallel. Third, notice that younger cohorts have smaller incidence of childlessness at all ages (e.g. in Figure 5.8 the proportion of childless women at age 34-36 is 34% in the P group, 30% in the C group and 27% in the T group). This is a pattern we find in our data and which is confirmed by official statistics (CPS report) as illustrated in detail in the previous section on childlessness in the US: during the first years of the 2000s childlessness declined slightly in every age group, except for women in their forties (see Figure 5.2 in Section 2.4).

Figure 5.8: Difference-in-Difference Design. Hypothetical example based on fictitious data.



Source: Elaboration of the author based on fictitious data.

Finally, the straight black line in Figure 5.8 after 2007 represents what actual data would look like if the crisis had a negative effect on fertility (positive on childlessness), while the dotted black line represents the counterfactual. The latter is the trend childlessness would have had in the treatment group had the recession not happened, extrapolated from the control group.

We expect the model identification assumption to be satisfied; namely we expect no systematic difference between treatment and control, because belonging to a certain birth cohort is randomly assigned and, therefore, the selection into treatment is also random.[243] [244] In other words, we assume that no unobserved shock, other than the treatment, happened between 2001 and 2010 that could have affected the outcome idiosyncratically in one group and not in the other[245].

[243] Moreover, we grouped women in small birth cohort intervals (only three years) so that women are born temporally close enough to be very similar.
[244] Within the potential outcome framework the possibility of attributing a causal effect to a non-manipulable variable, as in our case, birth cohort, is often debated. However, birth cohort is here used as a proxy of the true causal variable affecting childlessness, that is, the socialization environment in which the treated women spend part of their life cycle, i.e. the Great Recession (Dinas and Stoker (2014)).
[245] We support this claim with descriptive evidence in the following Results section.

4. Results on American Community Survey (ACS)

In this section I present the difference-in-difference causal estimates of the effect of the Great Recession on the cohort's probability of childlessness. To check the robustness of the findings to measurement errors I test the same hypothesis on two different datasets: I start in this section showing the results based on the ACS dataset and then in Section 5 I show that the results are very similar for the June CPS.

I further use other checks to control that the model is correctly identified and the estimates are robust. First, I test graphically whether the parallel trend assumption is met. Second, I present descriptive statistics comparing the distribution of key variables across the treatment and control cohorts to prove that they do not differ significantly in the main determinants of fertility. Third, I introduce a random placebo treatment in 2004 to compare the placebo pseudo-cohort of women born in 1965-67 to the control group of women born in 1968-70. Since the two pseudo-cohorts are composed of women who spend between age 34 and 39 in a non-recession period, I demonstrate that there is no effect on childlessness for them.

Table 5.2 indicates the percentage of childless White women in the three pseudo-cohorts in each wave of the ACS survey. The bold cells highlight the waves used to calculate the Difference-in-Difference and the placebo estimates. Childlessness at age 37-39 is around 23-24% in all cohorts and, as expected, the proportion declines within cohort while increasing slightly only in the treatment cohort at the age of 37-39 (Figure 5.9 plots the same figures).

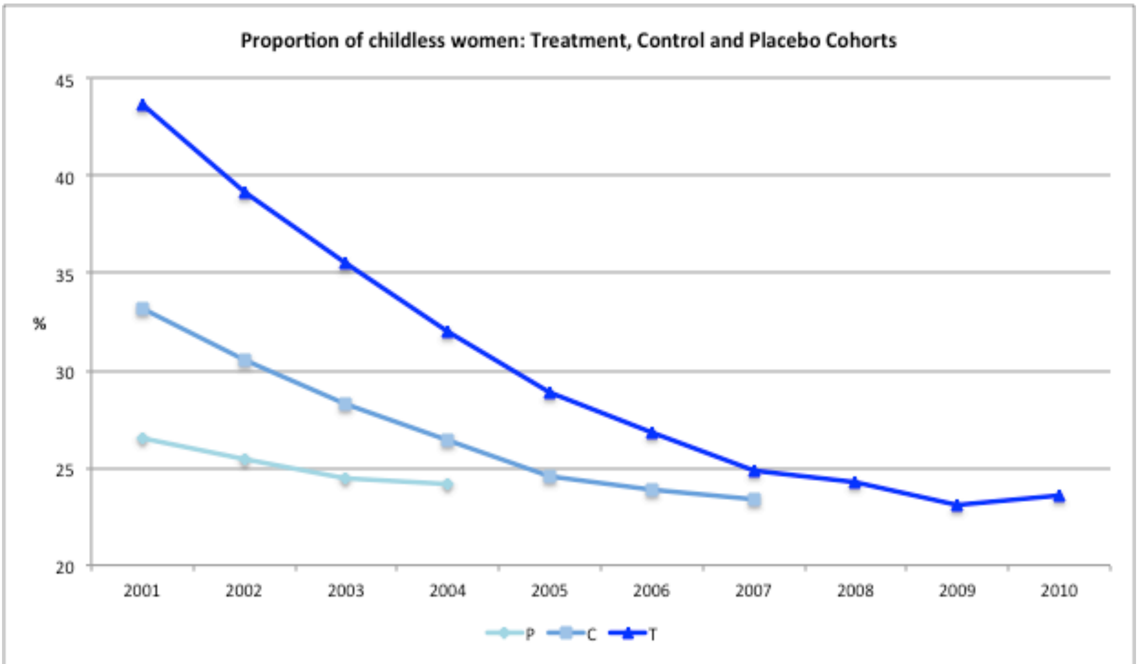
Table 5.2: Childlessness proportion in ACS.

		2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Cohort 1965-67	**P1**	**26,56**	25,43	24,42	**24,17**						
Cohort 1968-70	**C**	33,15	30,53	28,29	**26,44**	24,57	23,85	**23,36**			
Cohort 1971-73	**T**	43,62	39,17	35,49	32,00	28,86	26,82	**24,85**	24,25	23,09	**23,6**

Source: Elaboration of the author based on ACS data

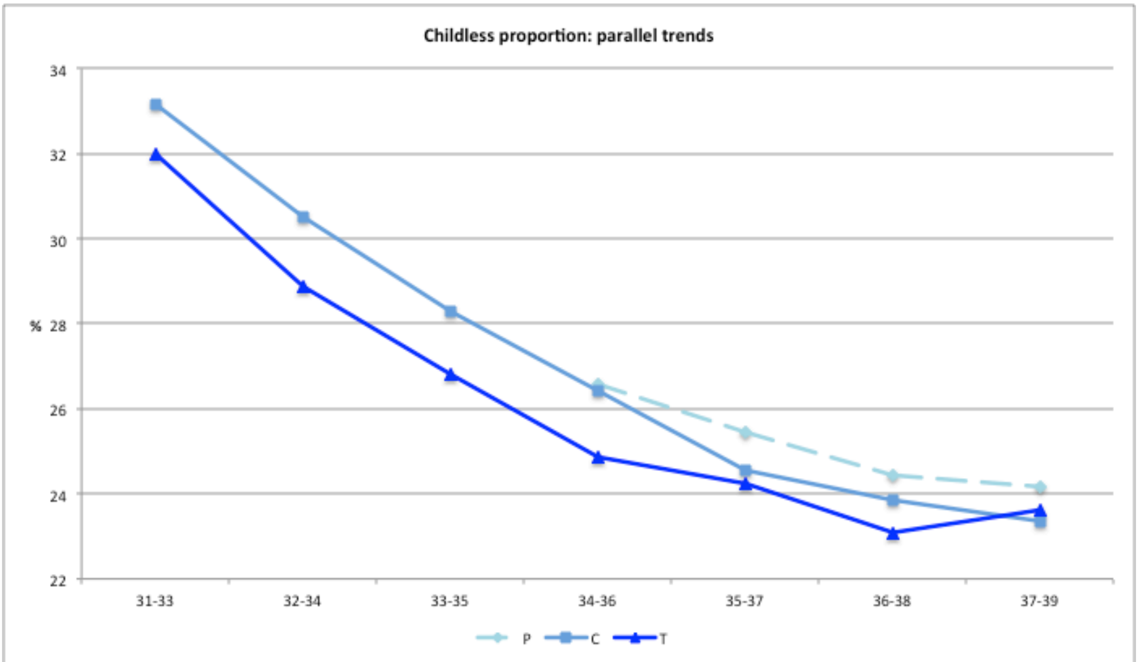
Figure 5.10 illustrates the trends in proportion of childless women in each cohort, this time by age instead of by year. The lighter the line the older is the cohort, and the dotted line represents the placebo. The trends seem parallel between the control and placebo, and also for the treatment group until 2007, the year in which the cohort 1971-73 turned age 34-36. From 2008 onward the childlessness paths of the control and placebo remain parallel while that of the treatment group deviates. There are more childless women than would be expected looking at previous cohorts in 2008. The proportion continues to be higher also in 2010 and 2011.

Figure 5.9: Childlessness proportion across Pseudo-cohorts in ACS.



Source: Elaboration of the author based on ACS data

Figure 5.10: Childlessness proportion by age groups in ACS.



Source: Elaboration of the author based on ACS data.

In Table 5.3 I compare the treatment and control groups at the age of 34-36 (when women enter in our study) and at the age of 37-39 (when the childlessness outcome is measured) on key determinants of fertility behavior, i.e. women's educational attainment, marital status and employment status. The table shows the means of each variable on the different groups and the confidence intervals. The group means are extremely similar and confidence intervals overlap for many cases, meaning that, at least in terms of these fundamental characteristics, our treatment and control groups are, on average not substantially different. I also conducted standard t-tests of the difference in means across groups and they also confirm that the group means are not statistically different at the age of 34-36, when childless women enter under observation. The t-test of the difference in means for the marital status variables tells us that the means are statistically equal between the treatment and control cohort at the age of 34-36 but they are substantially and statistically different at the age of 37-39. This is not surprising since partnering, the likelihood of marrying or divorcing are very likely affected by the Great Recession, and marital status is expected to be a mediating variable of the effect of the crisis on childbearing (as already emphasized in previous chapters).

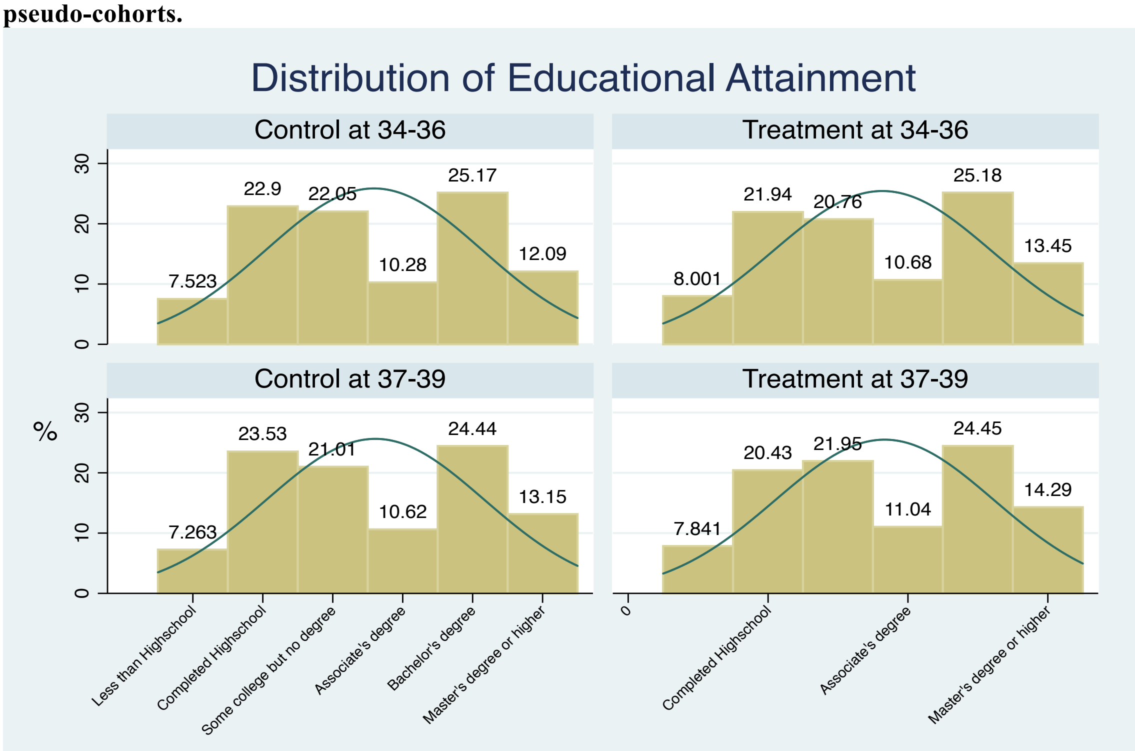
Table 5.3: Summary statistics by cohort (Treatment, Control, Placebo) at age 34-36 and 37-39. Means and confidence intervals. ACS data.

	34-36			37-39		
	Treatment 1971-73	**Control 1968-70**	**Placebo 1965-67**	**Treatment 1971-73**	**Control 1968-70**	**Placebo 1965-67**
	Mean	Mean	Mean	Mean	Mean	Mean
Education	3.63	3.59	3.42	3.67	3.61	3.49
	(3.62-3.65)	(3.57-3.61)	(3.40-3.44)	(3.65-3.68)	(3.59-3.62)	(3.46-3.51)
Marital Status	2.12	2.12	2.12	2.15	2.05	2.05
	(2.11-2.14)	(2.10-2.15)	(2.09-2.14)	(2.13-2.16)	(2.03-2.06)	(2.03-2.08)
Empl. Status	1.55	1.57	1.55	1.51	1.53	1.56
	(1.54-1.56)	(1.56-1.58)	(1.54-1.57)	(1.51-1.52)	(1.52-1.54)	(1.55-1.57)

Source: Elaboration of the author based on ACS data.

Notes: 95% confidence intervals in parentheses. Categories of Education are: 1 Less than high-school, 2 Completed high-school, 3 some college but no degree, 4 Associate's degree, 5 Bachelor's degree, and 6 Master's degree or higher. Categories of Marital status are: 1 Married with spouse present, 2 Married with absent spouse; 3 Separated, 4 Divorced, 5 Widowed and 6 Never married/single. Categories of Employment status are 1 employed; 2 unemployed; 3 not in LF.

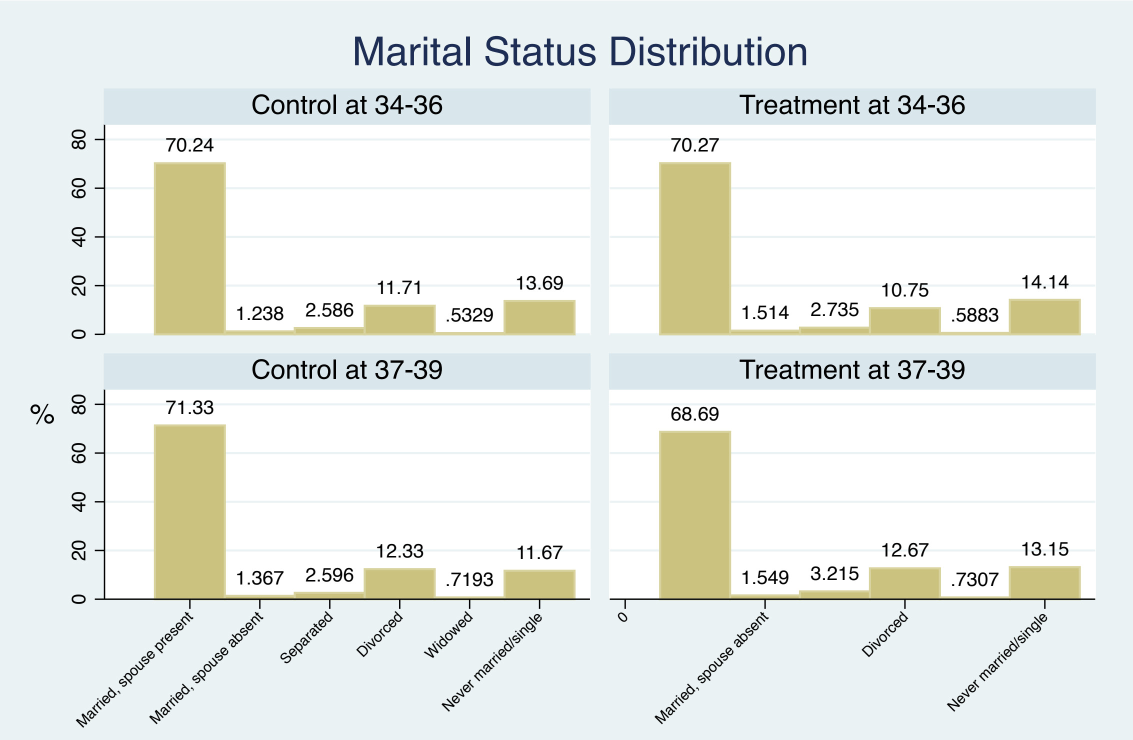
Figure 5.11: Distribution of educational attendance at 34-36 and 37-39 in ACS. Control *versus* treatment pseudo-cohorts.



Source: Elaboration of the author based on ACS data.

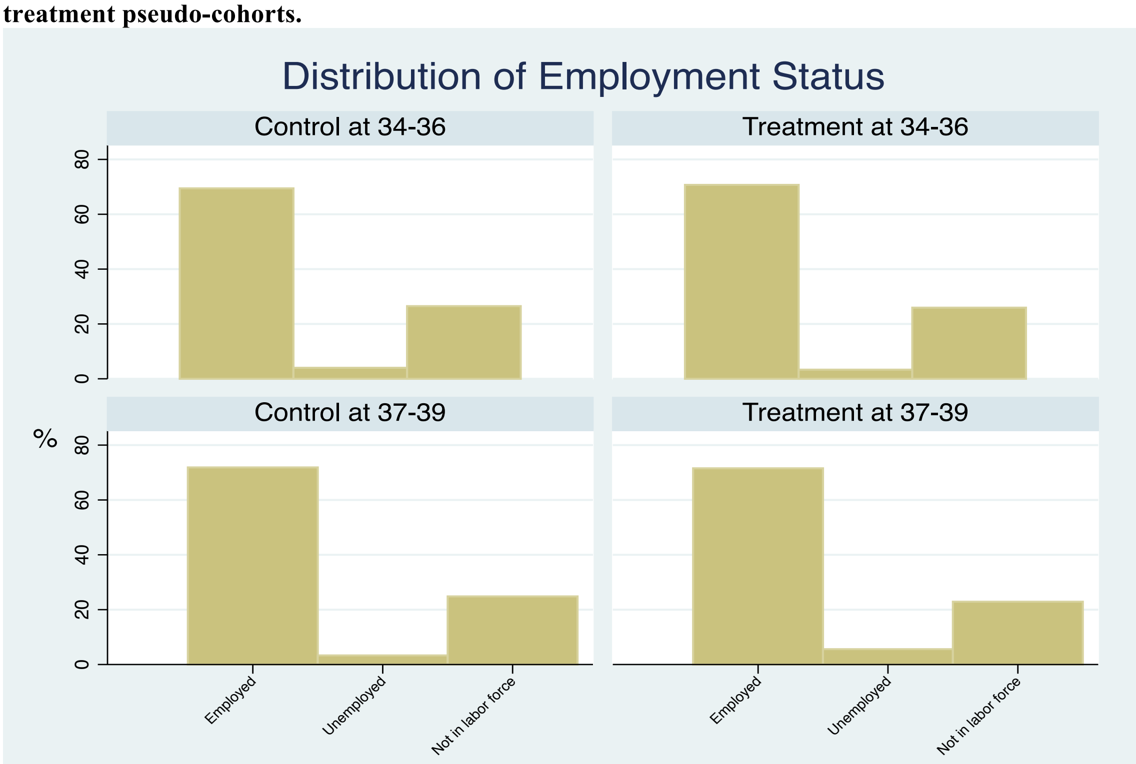
Since these are all categorical variables it is worthwhile also to look at the distribution across categories and check if they are also similar across the treatment and control groups of women. Figures 5.11-5.13 show the variables' distribution at different ages and in different groups. Again I find that the distribution respectively of educational attendance, marital status and employment status are almost identical across groups. On average women in all the four groups have some college but no degree, but more than a quarter of them in each group holds a bachelor degree. By their mid-thirties, more than 70% of the women in the sample are married, and around 11% are divorced. Single women are around 14% at age 34-36. Finally, the large majority of women is employed, around a quarter of them are out of the labor force and only around 3-4% of them are unemployed.

Figure 5.12: Distribution of women's marital status at 34-36 and 37-39 in ACS. Control *versus* treatment pseudo-cohorts.



Source: Elaboration of the author based on ACS data.

Figure 5.13: Distribution of women's employment status at 34-36 and 37-39 in ACS. Control *versus* treatment pseudo-cohorts.



Source: Elaboration of the author based on ACS data.

Besides the descriptive speculations, Table 5.4 reports the DD causal estimate of a Linear Probability Model (LPM) of the treatment on women's probability of being childless in the ACS dataset (Treatment versus Control). Models (1) and (2) report the results of the main period effect, while models (3) to (5) show the effect of the recession mediated by controlling for education, marital status and employment status. The control variables are categorical and the reference categories are: being married with the spouse present, being very low educated (less than high-school) and working.

The effect of the Great Recession on the probability of being childless for women age 37-39 is positive, though moderate, with a point estimate of +1.8/1.9% depending on whether we control for state fixed effect or not. This effect is estimated quite accurately, with a confidence interval that ranges from 1% to 3%.

The estimate is robust across models, also when controlling for state fixed effect, education, and marital and employment status. Marital status seems to be the strongest mediator of the effect of the recession on childlessness, reducing the effect to +0.9% for married (spouse present) women. Any marital condition different from being married with a (present) spouse strongly increases the probability of being childless, with the singleton condition being the worst. Higher levels of education are also correlated with a larger probability of not having children, controlling for marital status (Model (4)). Compared to the working condition, having a job but not working and being out of the labor force are associated with lower rates of childlessness (Model (5)). The results regarding control variables are extremely robust across models.

Table 5.5 illustrates the results for the comparison between the Control and Placebo cohorts. As predicted by the assumptions of the model, the placebo treatment has no significant effect on the difference in childlessness between the control and placebo cohorts, statistically and substantially. The results do not change when controls are added in the placebo treatment, where the magnitude of the effect is still around zero and statistically insignificant.

Table 5.4: Difference-in-difference estimates of the effect of the Great Recession on women's probability of being childless at 34-39. Linear Probability Models (ACS data). Treatment *versus* control.

	Treatment *versus* Control [a]				
	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)
Age 37-39 [b]	-0.031***	-0.032***	-0.031***	-0.021***	-0.022***
	(-0.038 - -0.023)	(-0.040 - -0.025)	(-0.039 - -0.024)	(-0.027 - -0.015)	(-0.029 - -0.016)
Treatment cohort	-0.016***	-0.017***	-0.017***	-0.019***	-0.019***
	(-0.023 - -0.008)	(-0.024 - -0.009)	(-0.024 - -0.010)	(-0.025 - -0.012)	(-0.026 - -0.013)
DD (Age 37-39*	0.018***	0.019***	0.019***	0.009**	0.008**
Treatment cohort)	(0.009 - 0.028)	(0.010 - 0.028)	(0.010 - 0.028)	(0.001 - 0.017)	(0.000 - 0.016)
Education [c]					
Completed Highschool			-0.010**	0.020***	0.008*
			(-0.019 - -0.001)	(0.012 - 0.028)	(-0.000 - 0.016)
Some college but no			-0.022***	0.018***	0.004
			(-0.031 - -0.013)	(0.010 - 0.026)	(-0.005 - 0.012)
Associate's degree			-0.031***	0.020***	0.002
			(-0.041 - -0.021)	(0.011 - 0.029)	(-0.007 - 0.012)
Bachelor's degree			0.023***	0.078***	0.063***
			(0.014 - 0.032)	(0.070 - 0.086)	(0.054 - 0.071)
Master's degree or higher			0.063***	0.110***	0.090***
			(0.053 - 0.073)	(0.102 - 0.119)	(0.082 - 0.099)
Marital Status [d]					
Married, spouse absent				0.336***	0.335***
				(0.315 - 0.357)	(0.314 - 0.356)
Separated				0.128***	0.122***
				(0.116 - 0.141)	(0.109 - 0.135)
Divorced				0.237***	0.228***
				(0.230 - 0.245)	(0.221 - 0.235)
Widowed				0.133***	0.134***
				(0.106 - 0.160)	(0.107 - 0.161)
Never married/single				0.622***	0.614***
				(0.616 - 0.628)	(0.607 - 0.620)
Employment Status [e]					
Has a job, not working					-0.047***
					(-0.059 - -0.035)
Armed forces, at work					0.028
					(-0.033 - 0.090)
Armed forces, not at					-0.202***
					(-0.235 - -0.169)
Unemployed					-0.010*
					(-0.021 - 0.000)
Not in the labor force					-0.064***
					(-0.068 - -0.060)
State fixed effects	No	Yes	No	No	No
Constant	0.264***	0.230***	0.261***	0.100***	0.135***
	(0.258 - 0.271)	(0.212 - 0.248)	(0.251 - 0.271)	(0.091 - 0.108)	(0.126 - 0.144)
N	150296	150296	150296	150296	150296

Source: Elaboration of the author based on ACS data.
Notes: * p≤0.05, ** p≤0.01, *** p≤0.001. Robust Confidence Intervals in parenthesis.
[a] In the Treatment group women turn age 37-39 in 2010 while in the Control group women turn age 37-39 in 2007. [b] Reference category is Age group 34-36.
[c] Reference category is Less than High school. [d] Reference category is Married with spouse present. [e] Reference category is working.

Table 5.5: Difference-in-difference estimates of the effect of the Great Recession on women's probability of being childless at 34-39. Linear Probability Models (ACS data). Placebo *versus* control.

	Placebo *versus* Control [a]				
	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)
Age 37-39 [b]	-0.024***	-0.023***	-0.025***	-0.015***	-0.015***
	(-0.032 - -0.015)	(-0.032 - -0.015)	(-0.033 - -0.017)	(-0.022 - -0.008)	(-0.022 - -0.008)
Placebo Cohort	-0.001	-0.001	-0.004	-0.006	-0.005
	(-0.010 - 0.007)	(-0.010 - 0.007)	(-0.013 - 0.004)	(-0.013 - 0.002)	(-0.013 - 0.002)
DD (age 37-39*Placebo Cohort)	-0.007	-0.009	-0.006	-0.005	-0.007
	(-0.018 - 0.004)	(-0.020 - 0.002)	(-0.018 - 0.005)	(-0.015 - 0.004)	(-0.017 - 0.003)
Education [c]					
Completed Highschool			-0.020***	0.015***	0.002
			(-0.031 - -0.009)	(0.005 - 0.024)	(-0.008 - 0.012)
Some college but no degree			-0.024***	0.014***	-0.001
			(-0.035 - -0.013)	(0.004 - 0.024)	(-0.011 - 0.009)
Associate's degree			-0.027***	0.021***	0.002
			(-0.039 - -0.014)	(0.010 - 0.032)	(-0.009 - 0.014)
Bachelor's degree			0.025***	0.070***	0.055***
			(0.014 - 0.036)	(0.060 - 0.080)	(0.045 - 0.065)
Master's degree or higher			0.070***	0.101***	0.082***
			(0.058 - 0.083)	(0.090 - 0.112)	(0.071 - 0.093)
Marital Status [d]					
Married, spouse absent				0.351***	0.350***
				(0.325 - 0.378)	(0.324 - 0.377)
Separated				0.124***	0.117***
				(0.108 - 0.140)	(0.101 - 0.133)
Divorced				0.234***	0.224***
				(0.225 - 0.242)	(0.215 - 0.232)
Widowed				0.136***	0.136***
				(0.103 - 0.169)	(0.103 - 0.169)
Never married/single				0.640***	0.631***
				(0.633 - 0.648)	(0.624 - 0.639)
Employment Status [e]					
Has a job, not working					-0.047***
					(-0.060 - -0.033)
Armed forces, at work					0.025
					(-0.048 - 0.097)
Armed forces, not at work					-0.221***
					(-0.230 - -0.213)
Unemployed					-0.009
					(-0.023 - 0.005)
Not in the labor force					-0.068***
					(-0.073 - -0.063)
State Fixed Effects	No	Yes	No	No	No
Constant	0.266***	0.234***	0.267***	0.109***	0.144***
	(0.260 - 0.272)	(0.211 - 0.257)	(0.256 - 0.278)	(0.099 - 0.118)	(0.134 - 0.155)
N	104164	104164	104164	104164	104164

Source: Elaboration of the author based on ACS data.

Notes: * p≤0.05, ** p≤0.01, *** p≤0.001. Robust Confidence intervals in parenthesis.

[a] In the Control group women turn 37-39 in 2007 while in the Placebo group women turn 37-39 in 2004. [b] Reference category is Age group 34-36. [c] Reference category is Less than High school. [d] Reference category is Married with spouse present. [e] Reference category is working.

5. Results on CPS Fertility Supplement

To verify the robustness of our findings, we repeat the analysis on the CPS June Fertility Supplement where the question posed to women is the number of *children they ever had*. Unfortunately, as mentioned, the CPS is biennial (conducted in even years) and it has a much smaller sample (Table 5.6 reports the size of each cohort by survey wave) compared to the ACS. Therefore, it is not possible to replicate the analysis in the exact same way in the two surveys. We can use 2010 as the post-treatment year as before, but we have to use 2006 as last pre-treatment year. This implies that we now need to form pseudo-panels of 4 birth-year intervals. The treatment group is that of women born between 1971 and 1974 and the control group that of women born between 1967 and 1970: in the former group, women turn age 36-39 in 2010 and in the latter they turn age 36-39 in 2006.

Table 5.6: Pseudo-panels size in the CPS Fertility Supplement.

Cohort		1994	1998	2002	2006	2010	*Tot.*
1959-62	P_2	4014	4025				*8039*
1963-66	P_1		3175	3789			*6964*
1967-70	C			3334	3195		*6529*
1971-74	T				2856	2851	*5707*
Tot.		*4014*	*7200*	*7123*	*6051*	*2851*	*27239*

Source: Elaboration of the author based on CPS June Fertility Supplement data.

In addition, with the CPS supplement we can go further back in time since the same survey was conducted also during the nineties. We thus now can have two placebo treatments: the first placebo is the group of women born in 1963-66 and the second in 1959-62. Except for these slight variations in the pseudo-cohorts though, the DD design is exactly the same as before. Therefore we can compare the results in the two surveys with the different question and check if the trend identified is robust.

Table 5.7: Childlessness proportion in the CPS Fertility Supplement.

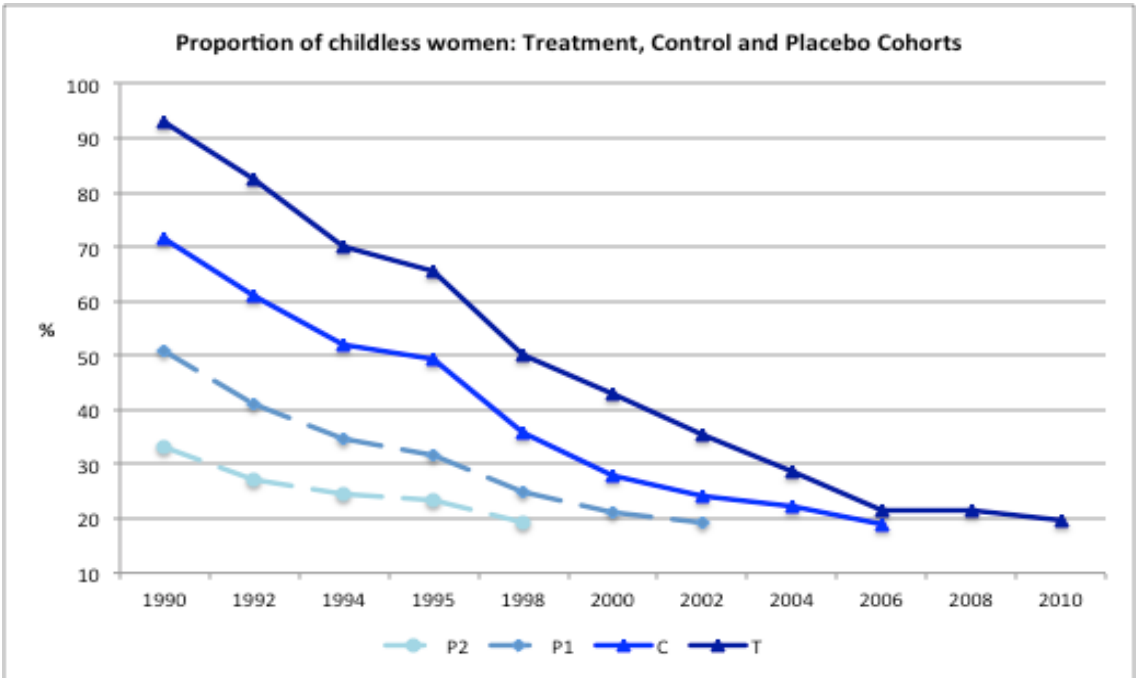
		1994	1995	1998	2000	2002	2004	2006	2008	2010
Cohort 1959-62	**P2**	**24.40**	23.48	**19.30**						
Cohort 1963-66	**P1**	34.71	31.78	**24.80**	21.27	**19.08**				
Cohort 1967-70	**C**	52.08	49.32	35.82	27.81	**24.11**	22.14	**18.97**		
Cohort 1971-74	**T**	70.09	65.44	50.20	42.81	35.48	28.47	**21.69**	21.60	**19.70**

Source: Elaboration of the author based on CPS June Fertility Supplement data

Table 5.7 is the analogue of Table 5.2 for the CPS data with the proportion of women in each cohort and year who stay childless, and Figures 5.14-5.15 below are the analogues of Figure 5.9-5.10. We now have two placebos (the two dotted lines in Figure 5.14-5.15) and the cohort trends seem reasonably parallel but more overlapping here in the CPS datasets compared to the ACS survey.

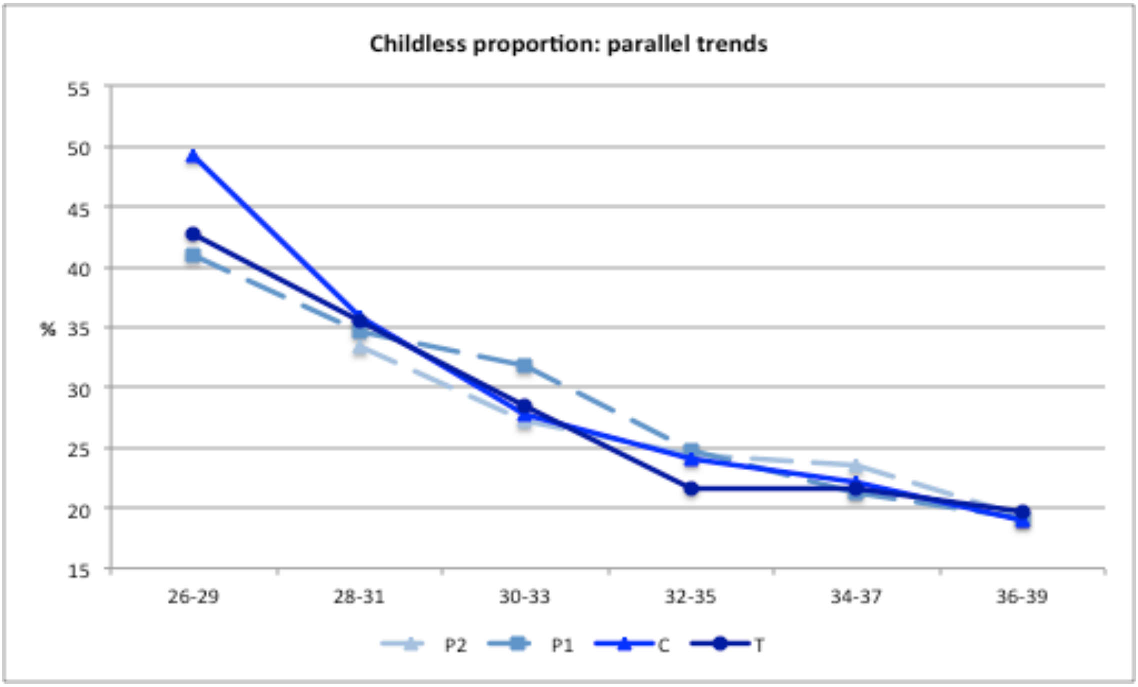
As already mentioned the percentages are smaller in the CPS sample because of the way the fertility question is posed in the two surveys. Nonetheless the cohort trends are pretty similar: in all cohorts but the treatment one, the proportion of childless women between the early and the late thirties declines about 5%. Only in the younger cohort (treatment) is this difference less than 2%.

Figure 5.14: Childlessness proportion across pseudo-cohorts in CPS.



Source: Elaboration of the author based on CPS June Fertility Supplement data

Figure 5.15: Childlessness proportion by age groups in CPS.



Source: Elaboration of the author based on CPS June Fertility Supplement data

The DD estimates reported in Table 5.8 confirm this fact. The point estimate of the effect on the treatment here is slightly larger than before, even though less precisely estimated: childlessness is 3.2% higher than what would have likely been in the absence of the Great Recession, controlling or not for state fixed effect (Models (1)-(2)). However, adding the mediating variable - marital status - the effect becomes statistically insignificant (but still positive at two percent)[246]. Confidence intervals are larger compared to the ACS sample where the sample size was much bigger: the lower bound estimate is slightly above zero while the upper bound gets to five or six percent depending on the model. Importantly, as shown in Table 5.9, the placebo treatment DD estimates are again substantially close to zero and the point estimates are statistically non-significant.

The larger size of the effect in the CPS compared to the ACS might be due to the different way the question is posed in the surveys. As argued before, the recession - if anything - had the effect of keeping children at home longer than before. This means that the estimates of childlessness in the ACS sample are a lower bound of the effect since more women might be classified as childless, when they are not, in the waves preceding the recession compared to waves after 2008. However, probably due to the smaller sample size, the CPS dataset yields imprecise point estimates of the effect.

[246] Employment status is not available for the June CPS, while education does not affect the estimate, as it was in the ACS case.

Table 5.8: Difference-in-difference estimates of the effect of the Great Recession on women's probability of being childless at 32-39. Linear Probability Models (CPS fertility supplement data). Treatment *versus* control.

	Treatment *versus* Control [a]			
	Model (1)	Model (2)	Model (3)	Model (4)
Age 36-39 [b]	-0.051***	-0.052***	-0.055***	-0.037***
	(-0.071 - -0.032)	(-0.072 - -0.032)	(-0.074 - -0.035)	(-0.055 - -0.019)
Treatment cohort	-0.024**	-0.026**	-0.030***	-0.033***
	(-0.045 - -0.003)	(-0.046 - -0.005)	(-0.051 - -0.009)	(-0.052 - -0.015)
DD (Age 36-39* Treatment cohort)	0.032**	0.032**	0.030**	0.022
	(0.003 - 0.060)	(0.003 - 0.061)	(0.001 - 0.059)	(-0.004 - 0.048)
Education [c]				
Completed Highschool			0.044***	0.063***
			(0.021 - 0.066)	(0.040 - 0.085)
Some college but no degree			0.067***	0.091***
			(0.043 - 0.092)	(0.066 - 0.115)
Associate's degree			0.069***	0.105***
			(0.041 - 0.097)	(0.079 - 0.132)
Bachelor's degree			0.145***	0.178***
			(0.120 - 0.169)	(0.154 - 0.201)
Master's degree or higher			0.216***	0.229***
			(0.185 - 0.247)	(0.200 - 0.257)
Marital Status [d]				
Married, spouse absent				0.097***
				(0.033 - 0.161)
Separated				0.054***
				(0.017 - 0.091)
Divorced				0.095***
				(0.072 - 0.117)
Widowed				0.104***
				(0.028 - 0.181)
Never married/single				0.481***
				(0.458 - 0.504)
State Fixed Effects	No	Yes	No	No
Constant	0.241***	0.227***	0.156***	0.044***
	(0.227 - 0.256)	(0.155 - 0.299)	(0.134 - 0.178)	(0.022 - 0.065)
N	12221	12221	12221	12221

Source: Elaboration of the author based on CPS June Fertility Supplement data.
Notes: * p≤0.05, ** p≤0.01, *** p≤0.001. Robust Confidence intervals in parenthesis.
[a] In the Treatment group women turn 36-39 in 2010 while in the Control group women turn 36-39 in 2006. [b] Reference category is Age group 32-35.
[c] Reference category is Less than High school. [d] Reference category is Married with spouse present.

Table 5.9: Difference-in-difference estimates of the effect of the Great Recession on women's probability of being childless at 32-39. Linear Probability Models (CPS fertility supplement data). Placebo *versus* control.

	Control *versus* Placebo1 [a]			
	Model (1)	Model (2)	Model (3)	Model (4)
Age 36-39 [b]	-0.057***	-0.060***	-0.061***	-0.038***
	(-0.077 - -0.038)	(-0.079 - -0.040)	(-0.080 - -0.042)	(-0.055 - -0.021)
Treatment cohort	-0.007	-0.010	-0.011	-0.008
	(-0.028 - 0.014)	(-0.031 - 0.011)	(-0.032 - 0.009)	(-0.026 - 0.010)
DD (Age 36-39* Treatment cohort)	0.006	0.008	0.006	0.003
	(-0.022 - 0.034)	(-0.020 - 0.036)	(-0.021 - 0.034)	(-0.022 - 0.027)
Education [c]				
Completed Highschool			0.035***	0.068***
			(0.014 – 0.057)	(0.047 – 0.088)
Some college but no degree			0.055***	0.090***
			(0.031 – 0.079)	(0.068 – 0.113)
Associate's degree			0.067***	0.102***
			(0.040 – 0.095)	(0.077 – 0.128)
Bachelor's degree			0.165***	0.188***
			(0.140 – 0.189)	(0.165 – 0.210)
Master's degree or higher			0.220***	0.231***
			(0.188 – 0.253)	(0.202 – 0.260)
Marital Status [d]				
Married, spouse absent				0.080**
				(0.016 - 0.145)
Separated				0.023
				(-0.008 - 0.055)
Divorced				0.083***
				(0.063 - 0.104)
Widowed				0.125***
				(0.049 - 0.200)
Never married/single				0.540***
				(0.519 - 0.562)
State Fixed Effects	No	Yes	No	No
Constant	0.248***	0.178***	0.167***	0.041***
	(0.233 - 0.263)	(0.121 - 0.236)	(0.145 - 0.189)	(0.020 - 0.062)
N	13476	13476	13476	13476

Source: Elaboration of the author based on CPS June Fertility Supplement data.
Notes: * p≤0.05, ** p≤0.01, *** p≤0.001. Robust Confidence intervals in parenthesis.
[a] In the Control group women turn 36-39 in 2006 while in the Placebo group women turn 36-39 in 2002. [b] Reference category is Age group 32-35. [c] Reference category is Less than High school. [d] Reference category is Married with spouse present.

6. Complementary analyses

I have replicated the DD analysis on different age groups of White American women, both younger and older than the age 37-39 group considered in the previous section. Table 5.10 illustrates the magnitude of the causal effect estimated exactly in the same way as it was presented in Models (1)-(2) in Tabs. 6-9 but for different pseudo-cohorts of women (ACS in Panel (a) and CPS in Panel (b)). Placebo treatment estimates are also presented in the cases in which we find an effect on the treatment group.

Table 5.10: Difference-in-difference estimates of the effect of the Great Recession on women's probability of being childless (LPM) varying the age range in ACS (a) and in CPS (b).

(a)

Cohorts	Age at Treatment in 2007	Age in 2010	Treatment Effect Probability of Childlessness	Placebo Treatment Effect
1966-68	39-41	42-44	-.004	-
1967-69	38-40	41-43	-.001	-
1968-70	37-39	40-42	-.003	-
1969-71	36-38	39-41	+.002	-
1970-72	35-37	38-40	+.003	-
1971-73	34-36	37-39	+.018***/+.019***	-.009/+.013
1972-74	33-35	36-38	+.017***/+.018***	-.005/-.007
1973-75	32-34	35-37	+.014***/+.015***	.004/.001
1974-76	31-33	34-36	+.010*/+.012**	-.004/-.007

(b)

Cohorts	Age at Treatment in 2006	Age in 2010	Treatment Effect Probability of Childlessness	Placebo Treatment Effect
1966-69	37-40	41-44	-.021	-
1967-70	36-39	40-43	-.006	-
1968-71	35-38	39-42	-.005	-
1969-72	34-37	38-41	+.003	-
1970-73	33-36	37-40	+.013	-
1971-74	32-35	36-39	+.030**/+.032**	-.001/+.006
1972-75	31-34	35-38	+.034**/+.036**	-.007/-.006
1973-76	30-33	34-37	+.040***	-.015/-.016

Source: Elaboration of the author based on ACS and CPS June Fertility Supplement data.
Notes: * p≤0.05, ** p≤0.01, *** p≤0.001.

In both samples we find an effect of the Great Recession on the probability of remaining childless for women in their thirties. The magnitude of the effect is also quite robust, ranging from 1-2% in the ACS sample, depending on the age of women and the model specification, to 3-4% in the CPS June Fertility Supplement. On the other hand, no effect is found when we consider age groups older than 40. This result is in line with previous findings that suggest that economic downturns mainly have an effect on fertility postponement at younger ages (Currie and Schwandt 2014).

Finally, I have complemented the DD analysis with an analysis of the effect of unemployment rates on childlessness, controlling for other unobservable traits common to the year and state of residence. Table 5.11 presents the estimates of a Linear Probability Model on the probability of being childless at age 37-39 with year and state fixed effects. Model (1) shows the effect of state unemployment rate in the year *t* on the probability of being childless in the year *t+1*. In the next models (2) to (4) I add controls at the individual level. In none of these specifications do I find any effect of state unemployment rate. I do find that being unemployed is associated with about 3 percentage points higher probability of being childless, although this association vanishes once marital status is included in the model.

Education has a U-shaped correlation with cohort childlessness: very low and very high education is associated with greater childlessness. Compared to married women with the spouse present all other marital status categories increase the likelihood of remaining childless.

I have changed the bandwidth of the age group (37-40, 36-40, 36-41) and the results do not change[247] and I have also replicated the analyses for different age groups (20-24, 25-29 and 30-34)[248]. In line with previous studies (Currie and Schwandt 2014) I do find a positive association between state level unemployment and childlessness among younger women age 20 to 24 (Table A4.2 in Appendix 4). All in all, still, these results suggest that the effect of the Great Recession for the cohort of women born between 1971 and 1973 found in the DD analysis is not spurred by an increase in unemployment level at the state level. Other mechanisms, such as a perceived sense of economic insecurity throughout the country, might account for the reduction in childbearing among women in their middle and late thirties. This result once more confirms what I found in the previous chapters on women of all ages: aggregate rising unemployment rates do not affect the probability of having or not the first child.

[247] See Table A4.1 in Appendix 4.
[248] See Table A4.2 in Appendix 4.

Table 5.11: Complementary analysis on the effect of state unemployment rate on childlessness. Linear Probability Models (ACS).

	37-39 year old women			
	Model (1)	Model (2)	Model (3)	Model (4)
Mean-cent. State Unemployment rate (lagged) [a]	-0.001	-0.001	-0.002*	-0.002***
	(-0.003 - 0.000)	(-0.003 - 0.000)	(-0.003 - 0.000)	(-0.004 - -0.001)
Education [b]				
Completed Highschool		-0.004	-0.021***	0.016***
		(-0.010 - 0.001)	(-0.026 - -0.015)	(0.011 - 0.020)
Some college but no degree		-0.024***	-0.043***	0.002
		(-0.029 - -0.018)	(-0.049 - -0.038)	(-0.003 - 0.007)
Associate's degree		-0.029***	-0.053***	0.005*
		(-0.035 - -0.023)	(-0.059 - -0.047)	(-0.000 - 0.011)
Bachelor's degree		0.006**	-0.014***	0.046***
		(0.000 - 0.011)	(-0.019 - -0.008)	(0.041 - 0.051)
Master's degree or higher		0.038***	0.011***	0.069***
		(0.032 - 0.044)	(0.005 - 0.017)	(0.064 - 0.075)
Employment status [c]				
Unemployed			0.030***	-0.002
			(0.024 - 0.037)	(-0.009 - 0.004)
Not in labor force			-0.101***	-0.052***
			(-0.104 - -0.098)	(-0.055 - -0.050)
Marital status [d]				
Married, spouse absent				0.334***
				(0.321 - 0.346)
Separated				0.126***
				(0.118 - 0.133)
Divorced				0.228***
				(0.224 - 0.232)
Widowed				0.167***
				(0.151 - 0.182)
Never married/single				0.620***
				(0.616 - 0.624)
Year Fixed Effect [e]	Yes	Yes	Yes	Yes
State Fixed Effect [f]	Yes	Yes	Yes	Yes
Constant	0.212***	0.215***	0.258***	0.113***
	(0.200 - 0.223)	(0.203 - 0.227)	(0.246 - 0.271)	(0.102 - 0.125)
N	437637	435697	435697	435697

Source: Elaboration of the author based on ACS data.
Notes: * p≤0.05, ** p≤0.01, *** p≤0.001. Robust Confidence intervals in parenthesis. The analysis on different age groups and varying the bandwidth yield very similar results and are available in the appendix.[a] Mean state unemployment rate in the period 2000-2012 is 6.36%. [b] Reference category is Less than High school. [c] Reference category is being employed. [d] Reference category is Married with spouse present. [e] Years available are 2000-2012, the reference year is 2010. [f] Reference state is Alabama.

7. Conclusions

This last empirical chapter of the thesis investigates the causal effect of the Great Recession on the postponement of first births by American White women in their thirties.

If follows two previous chapters addressing some of the mechanisms of transmission of economic uncertainty from the aggregate and individual employment conditions to childbearing, and in particular to first births. In all the three empirical chapters of this thesis I do find a negative effect of the Great Recession on the transition to parenthood.

In this chapter the identification of the causal effect is conducted exploiting a 'treatment at a specific age with pseudo-cohorts' and applying the difference-in-difference (DD) technique to synthetic cohorts of White American women. Women are not compared across space, as in traditional difference-in-difference models, but across age-periods: the treatment group is composed of White women age 37-39 in 2010 while in the control group women turn the same age in 2007, before the onset of the crisis. I measure cohorts' childlessness rates for the treatment group between 2007 and 2010, whereas between 2004 and 2007 for the control group, who have spent their late thirties not in the recession period but just before. Then I difference out cohort-specific and time-specific trends through the DD estimate of the effect of the Great Recession on the proportion of women who remain childless in each group. Due to the data limitations of both US census surveys, the ACS and the June CPS, and to further check the robustness of our findings, I repeat the analysis on both samples and compare the results. The surveys differ in the way the fertility question is posed, in their sample size and in their frequency but, nonetheless, as shown in previous sections, they are comparable.

Provided the assumption of parallel trend is met, the difference-in-difference design applied in the investigation permits me to attribute the entire effect to the treatment, that is, the recession. This seems to be the case here given that the placebo tests conducted on both samples give a substantially and statistically zero-effect of the placebo treatment. There is no difference in childlessness probability at age 37-39 across cohorts of women in the ACS survey who do not spend their late thirties in the Great Recession; in other words, there is no effect of the treatment, without the treatment. It is noteworthy that this is also the case when we look at the June CPS sample and measure childlessness at age 36-39.

The DD analysis shows a positive, though mild, effect: depending on the sample, the main period effect of the crisis on the proportion of childless 37-39 year-old women ranges from 1.8% to 3.2% (ACS and CPS respectively)[249]. In both cases the effect of the Great Recession is not very large,

[249] As mentioned, this sizable difference between the two samples could be explained by the way the different questionnaires are conducted. If this is the case, the true effect is that of the CPS where the key question is on the *number of (biological) children ever had*, and the difference of the DD estimate

and confidence intervals are quite wide, especially in the CPS smaller sample where, even though positive, the lower bound is close to zero (i.e. 0.003 in models (1)-(2) in Table 5.8).
Nonetheless, I can try to quantify how big this effect is, in the more conservative case of a 1.8% increase in childless as found in the ACS sample (a 1% sample of US population). In the treatment cohort in 2010 I have 43385 White women, meaning that in the US population there were in 2010 around 4.34 million White women age 37-39. My estimate suggests, in the most optimistic scenario, that roughly 78000 White American women age 37-39 remained childless due to the recession. In terms of general fertility rate, this implies a decline of 78 births per 1000 women age 37-39.
Currie and Schwandt (2014) found a very close effect in their study, although studying the effect of unemployment rate experienced at younger ages around age 20-24. They showed that a 1% increase in unemployment reduces completed fertility at age 40 of about 14 conceptions per 1000 women. Considering that in the US the unemployment rate rose during the Great Recession around 5%, the estimate by Currie and Schwandt (2014) predict a decline of 70 births per 1000 women.

The focus on 37-39 year-old women follows the rationale of trying to quantify the persistent effect of the crisis on fertility, focusing on women close to the end of their reproductive life for whom a postponed birth likely means a forgone child, due to the biological difficulties in conceiving after the age of 40. In this respect it is important to stress that first birth rates of women age 40-44 have been stable at about 2.2 and 2.3 births per 1000 women of that age (CDC/NCHS) between 2008 and 2013. This means that if women around age 37-39 postponed childbearing during the crisis of 2007-2009, as I have shown in this paper, there is no evidence that those postponed births were recuperated after 2010.
I have also replicated the analysis varying the age range. I show that this crisis-related effect of increasing childlessness rates is larger among women in their early thirties. However, as already mentioned, women in their early-to-mid thirties could still recuperate the postponed births after the end of the Great Recession, while this seems very unlikely for women close to their forties.

Rising rates of childlessness have implications both for societies and individuals. First, childlessness has demographic implications like declining birth rates and population decline and ageing. Second, these changes in the population structure have economic implications such as an increase in the dependency ratio (the proportion of retirees to working age population) which burdens public spending and generates intergenerational imbalances in the distribution of economic resources (e.g. spending in the elderly health care system versus spending in education and social benefits). At the individual level, there is no evidence of any health-related or emotional cost of childlessness, even though the case of women who remain childless because of postponing motherhood is seldom treated.

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with the ACS (where the question in on the *number of (biological) own children residing in the household*) is due to more families keeping the children at home due to the recession, a factor decreasing the difference in the treatment group and reducing the ACS point estimate.

Nonetheless, childless old individuals, especially if in poor health, have been shown to be substantially more likely to be socially isolated (Bachrach 1980; Koropeckyj-Cox and Call 2007; Connidis, I.A. 2010) and in institutionalization (Rowland 1998).

As in previous chapters, I also here touch upon some possible mechanisms through which the crisis might affect fertility and, in this specific case, childlessness. In the analysis I control for education, marital status and state level unemployment rates. Considering that I am focusing on women at about the age of forty, their educational level is very likely exogenous to the model and a pure control variable. In fact there is no evidence of a mediating effect of education at age 37-39, unlike the marital status case. The economic crisis puts a strain on marriages, both in terms of the likelihood of new marriages and the survival of existing ones. If marriages as less frequent due to the recession, births are also less likely. This is clearly evident from my findings, as adding marital status to the model halves the main period effect (e.g. Model (4) in Table 5.4): married women with a present spouse in our treatment group are far less likely to stay childless because of the recession, while single 37-39 year-old women are the ones with the highest risk.
As also shown in previous chapters, rising unemployment rates experienced at older ages, does not appear to be a major factor in deciding whether a woman remains childless in her late thirties (see Table 5.11). In line with previous studies (Sutton et al. 2010; Percheski and Kimbro 2014; Currie and Schwandt 2014) I only find an effect of unemployment rates on childless young women, particularly in the age range 20-24. Dehejia and Lleras-Muney (2004) also find that in the US the fertility response to rising unemployment differs substantially by ethnicity and socioeconomic status: for instance, the negative effect of an increase in the unemployment rate is twice as much for Blacks compared to Whites.[250]

As a final remark I want to mention that the research design that I have used in this analysis could be usefully further extended to study childlessness rates in the European countries, using for instance the Labor Force Survey Data. The identification strategy based on a 'treatment at a specific age with pseudo-cohorts' could be applied to study other outcomes, like higher parities, for instance the proportion of couples with 2 or 3 children; or to study other treatments like past recessions or policy interventions that create incentives or disincentives for childbearing.

[250] Even though preliminary analyses conducted on ACS and CPS data suggest it is not the case for the effect of the Great Recession on childlessness rates of African American women close to their forties.

CHAPTER VI

CONCLUSIONS

1. Introduction

> "Depressions, wars and periods of extreme social ferment often produce major reorientations of society. […] In periods of crisis the element of chance seems to play a major role in influencing life outcomes" and "short-run considerations outweigh the potential consequences of an action for the future welfare of the household or the individual"
>
> J.A. Clausen, foreword to G. H. Elder *Children of the Great Depression* (1974): xv-xvii.

This thesis contributes to the crucial and long-standing debate on the economic determinants of fertility behavior. The recent Great Recession that occurred in western societies offers an example of extraordinary uncertain economic circumstances that are worthwhile exploring in depth. As J.A. Clausen argues in the foreword of G.H. Elder's book *Children of the Great Depression* (1974), extreme social and economic ferment affects households' and individual's lives sharply.

This study addresses essentially the issue of how families changed their childbearing behavior depending on the economic conditions they faced during the Great Recession. In particular I focus on the extensive margin of fertility, namely the transition to parenthood and the diffusion of childlessness in American society, and on how the latter respond to labor market insecurity.

After an extensive introductory analysis of the macro-trends and the aggregate relationship between financial and macroeconomic indicators and birth rates in the US and Europe (Chapter II), the specific purposes of this thesis can be summarized by four principal research questions.

First, I investigate how the aggregate and the individual cross-level economic and employment uncertainties generated by the crisis interact in shaping the transition to the first child in the US. This is a cross-cutting research question addressed in both Chapters III and IV.

Second, looking both at American couples' employment dynamics (Chapter III) and women's socioeconomic intergenerational mobility (Chapter IV) I investigate the mechanisms of transmission of uncertainty from the labor-market dimension to the family domain, and in particular again to the transition to the first birth.

In the third chapter I ask how the probability of becoming parents depends on the different working status dynamic of the couple: is it the husband's employment status that matters for having the first child? Does having a non-working wife increase the likelihood of parenthood? These are some of the questions I answer in Chapter III.

The fourth chapter focuses on women testing the Easterlin Hypothesis of resources and aspirations. The research question guiding the analysis in Chapter IV is whether women measure their socioeconomic position based on the aspirations they formed in their family of origin, and whether they further decide to become mothers only once they reach at least the position of their parents.

Finally, the remaining two research questions are answered in the last empirical chapter. In Chapter V I address, first, the causal effect of the Great Recession on childlessness in the US, using a design-based approach, and second, the existence of a permanent effect of the crisis on cohort childlessness among women close to the end of their reproductive lives[251].

In the remainder of this last concluding chapter I first outline the main contributions of this thesis to the literature and its principal empirical findings. Second, I illustrate the main limitations of this study and, third, before I finally conclude, I also speculate on some possible promising future streams of research on the topic of the economic determinants of fertility, as suggested by the findings of this thesis.

[251] Note that Chapter V is a joint work with Professor Fabrizio Bernardi and an earlier and reduced version has been published in the IZA Journal of Labor Economics in November 2015 (see Comolli and Bernardi 2015).

2. Major contributions and findings

The first empirical Chapter II contributes to the existing literature on the relationship between business-cycle fluctuations and aggregate fertility rates. Research on birth rate-response to the Great Recession mainly focuses on the pro-cyclical correlation between economic growth or unemployment rates, and fertility rates, during the first years of the crisis. Also most studies look at the United States and Europe separately.

The main innovative features of my study are the following: first, I make use of more recent data that allow me to make a comparative analysis of the European and the American cases; and second, I look not only at the fertility response to unemployment increases during the Great Recession but I also investigate the effect of financial and economic policy uncertainty on births. To measure this uncertainty I use an index of economic policy uncertainty (EPU) created by three American professors. I also use sovereign debt risks, measured in absolute terms with government bonds' yields and in relative terms via the spread between countries' bond yields and the German 'safe' bonds.

In line with the existing empirical evidence, my results show that the crisis depressed birth rates both in the US and in European countries, and that the largest negative effect was registered on first births among very young women. Among older women the negative effect was especially concentrated on higher-order births.

The original findings of my study reveal that the increase in unemployment rates in Europe and the US was responsible for more than the two-thirds of the average decline in the general fertility rate in those countries. However, although the elasticity of birth rates to unemployment is larger than to financial uncertainty measures, the latter did also have a substantial impact on general fertility rates, especially in the US and in southern European countries. Specifically the negative effect of the economic policy uncertainty in the US and the sovereign debt risk in southern European countries and the birth rates was sizable and comparable to the effect of unemployment.

The bottom line empirical contribution of Chapter II is thus that, at the aggregate level, we witnessed a substantial decline in births during the Great Recession, and that this decline strongly correlates not only with the – usually investigated – structural objective macroeconomic conditions of countries (unemployment rates) but also with indicators of the economic and financial uncertainty generated by the crisis.

However, the results do not reveal the mechanisms that explain this fertility drop. Leaving the aggregate perspective and moving to an individual-level (single-country) investigation, the purpose of the two central chapters of this thesis is essentially to test some of the mechanisms identified by the literature.

More precisely, Chapter III and IV focus on the transition to the first child and how the latter is affected by the employment instability generated by the Great Recession in the United States. In both chapters I analyze the cross-level interplay between aggregate labor market conditions and the individual-household employment position; also I rely on the same American dataset, the Panel Survey of Income Dynamics, for both chapters.

However, while Chapter III investigates couples' employment, unemployment and non-employment dynamics, in Chapter IV the focus is on women and the analysis investigates not only the employment/unemployment dynamic, but also the influence of intergenerational occupational mobility on motherhood.

The two chapters show common results. First, notwithstanding the strong correlation in the macro-level analysis conducted in Chapter II, aggregate unemployment rate per se seems not to explain in micro-level analyses the negative impact of the Great Recession on first births. Second, my findings tend to exclude the possibility of any moderating effect of aggregate macroeconomic conditions, supporting instead the opposite hypothesis of a negative multiplicative effect of individual-level employment insecurity on the transition to the first child.

At the couple-level, husband's unemployment reduces the probability of parenthood compared to dual-earner couples, but even in the case that he is employed, if the wife loses her job or goes out of the labor force the likelihood of first birth declines compared to dual earners.

Considering women only (without considering the husband's occupation) I found that the hazard of first birth during the Great Recession in the US is larger for immobile or upward mobile women, compared to the downward mobile, confirming the Easterlin Hypothesis of resources and socioeconomic aspirations (formed in the family of origin).

The negative multiplicative effect of the crisis on the transition to first birth was strongest on non-working women: after the onset of the Great Recession women out of the labor market were the slowest to reach motherhood (compared to downward and upward mobile women).

All in all the two investigations in chapters III-IV suggest that the work and family dimensions are positively linked and that reconciliation between the two domains is not the main driver of postponement during the last decade – of intense financial and economic insecurity – in the US. Couple's employment uncertainty and women's unemployment and downward mobility correlate to the postponement of parenthood.

Both chapters' analyses point to the same mechanism of transmission of insecurity from the working to the family domain, namely the income effect. The reduction in couples' earnings due to either the

husband's or the wife's job loss seems responsible for the postponement of childbearing during the Great Recession[252], with childless dual-earner couples being the most likely to have children.
In contrast, neither of the analyses supports the hypothesis that the reduction of the opportunity cost of childbearing arising from the job loss of one of the two partners speeds up the transition to parenthood.

Chapters II-IV follow the demographic and sociological literature in their attempt to moderate the influence on unobserved heterogeneity in the estimates, by adopting well-suited statistical tools to control for the possible bias in the estimates of the effect of labor-market conditions on the fertility decisions. However, I cannot rule out the possibility that some unobserved couples' or individuals' characteristics bias the estimates, influencing both employment *and* fertility decisions. Therefore, the last empirical - design-based - Chapter V is dedicated to the assessment of a causal effect of the Great Recession on the extensive margin of fertility, namely childlessness.
In addition, the results from the previous chapters suggest that the crisis does have a postponement effect on the transition to parenthood, but from the available data, I cannot infer whether the complete fertility of those women would be affected or not. This is the second purpose of Chapter V: assessing whether there is a permanent effect of the Great Recession on births.
The difference-in-difference estimates suggest there is a *permanent* increase in cohort childlessness *caused* by the crisis in the US. The increase in the proportion of women around the age of 40 who remains childless due to the crisis is not very large, as expected from previous findings from the literature, but it is significant and, moreover, judging from the robustness checks conducted in Chapter V, I am confident that those births were not recuperated after the recession. Thus, we can label this decline in first births a permanent consequence of the Great Recession on fertility.
A final major contribution of this last empirical chapter is the innovative and very flexible research design adopted for the analysis. The difference-in-difference approach applied to pseudo-panels of women has rarely been implemented in studies of fertility but it is very versatile. I show that it can be helpful in situations where it is complicated to identify a suitable treatment/control comparison.

[252] As mentioned earlier to investigate the other two mechanisms suggested by the literature, namely the adverse and the uncertainty reduction effect, I would need a much larger sample to conduct analyses that differentiate among age, occupational tenure and different socioeconomic and educational groups.

3. Limitations

Despite the several contributions of this thesis to the literature on economic determinants of fertility in advanced societies, the study is limited in some important ways.

First of all, as already argued in the introductory chapter, the promptness of this investigation, conducted almost simultaneously with the unfolding of the Great Recession, implies that some limits had to be imposed on the dynamics under study. First, I could not observe the complete fertility of those women affected by the Great Recession and, second, I had to confine my investigation to the American case where the recession had hit before, and in a more delimited period, compared to European countries that suffered from a second strong recession phase after 2011. For these reasons the analysis is limited to the effect that the crisis had on the extensive margin of fertility (first birth and childlessness) and on the US. I managed though to partially solve the problem of not observing any permanent effect of the crisis on births by measuring in the Chapter V the rise in childlessness among women close to the end of their reproductive lives and for whom a recuperation of those births after the recession is very unlikely. In the results of the chapter I also compare the effect across different age groups of women and show that the increase in childlessness is not confined to women close to age 40 but that it is a common finding for all women in their thirties.

In fact, the focus of the study on first births generates the issue of a necessary selection effect arising from the comparison between childless couples and women of different ages. As is particularly evident in Chapter III, clearly the group of women reaching age 30 without children represents a selected slice of the female population with different priorities, attitudes and behavior not always under control in the models. Following the literature I attempt to control as much as feasible for this selection effect through the statistical model applied (that controls for women's age at entrance in the survey in the Cox models in Chapter III), by adding all the observable controls that might affect the selection process and in Chapter V, as mentioned, by comparing results across age groups of women.

A second group of caveats is more methodological in nature. The first methodological limit is that, despite employing different statistical methods, this thesis only makes use of quantitative instruments, without using any qualitative tool. The latter would have brought the present investigation to a deeper level on the decisional process at the basis of the transitions to parenthood and its economic determinants. Moreover, in-depth interviews would allow one to tailor the specific questions to the mechanisms that the researcher aims at uncovering. In my case I relied on surveys designed to evaluate behavior in a long list of different domains.

An example of this kind of limitation is the less-than-optimal way in which the question on childbearing is posed in the American Community Survey (ACS). In the latter the questionnaire asks about the number of children residing in the house and not the total number of children. To reduce the measurement error generated by that question I replicated the analysis on a similar dataset and show that the estimates are robust. In this way I managed to limit this problem.

The second methodological caveat is that, due to data limitations, I had to take as exogenous and fixed over time, a list of individuals' and couples' characteristics that might influence the process under study. I, in fact, assumed that attitudes towards childbearing or towards career are exogenous and time-invariant, and that therefore the fixed effect model I apply in my analyses in Chapters III-IV controls for those characteristics. This is very likely not the case since a major economic shock like the Great Recession might have also affected and reshuffled individual priorities and might have influenced beliefs and attitudes together with behavior. If this is true, there are missing variables in my models that affect both the likelihood of being in a certain occupational position *and* the likelihood of childbearing.

One way I tried to overcome this problem is to focus in Chapter V on a more designed-based study, exploiting randomization, to exclude any unobserved difference between the treated and the control group of women. I show that there is a causal effect of the crisis on the likelihood of childlessness among women below age 40. The latter result would suggest that there is a negative causal effect on first birth among American women, which confirms the findings of the previous chapters. However, there is still no guarantee that my estimates of the fixed effect and event history models are completely free of selection and unobserved heterogeneity.

A third methodological caveat is related to the complexity of the statistical models and the substantial interpretations of my findings.

To begin with, the micro-level analyses of Chapters III-IV suffer from the problem of a PSID dataset's sample size, which is not always large enough to reach a minimum cell size in the category of interest to get statistically significant estimates. The complexity of the models, involving cross-level interactions, couples' working-status combinations and the detailed employment and occupational mobility categorization, reduce the cell size especially in the categories of the most uncommon employment conditions. Moreover, sometimes this happens in the categories I am more interested in, for instance the couples where both partners are unemployed (Chapter III) or the downward mobile women during the recession (Chapter IV). There is not much that I could do about that unfortunately. However I tried to offer meaningful interpretations of the estimates, beyond their statistical significance. For instance, in the case of the non-linear Cox model of Chapter IV, the interpretation of the interaction effects was arduous, therefore, I relied on the graphical representation of the different profiles of women.

A final crucial caveat is that I do not test alternative causes of the decline in fertility witnessed in the United States in the last ten years. I focused throughout the thesis only on the economic rationale of parenthood while other factors in the same period might have been co-responsible together with the crisis, for the postponement of first births in the United States. Among the issues that are deemed by scholars to be central to short-term changes in childbearing trends and that are missing in this thesis include changes in the welfare state or family policy provisions (Aassve 2008; Aassve and Lappergaard 2008) and migration (Goldstein et al 2009; Esping-Andersen and Billari 2015; Parrado 2011).

The relevance of the welfare state for fertility behavior is undeniable. Family policies shape, on the one hand, the economic incentives and constraints for childbearing decisions. In countries where the welfare state offers high-quality universal childcare and a mother-friendly labor market such as the Scandinavian countries, the reconciliation of work and family domains is easier and the incentives to childbearing are larger, compared to countries where family policies are few or very weak.

On the other hand, in the long run, family policies' change also affects behavioral norms by subsidizing one type of behavior instead of another, for instance incentivizing marital versus non-marital births.

In the US during the nineties the structure of the public assistance programs to low-income families changed quite a lot, especially in the direction of giving greater discretion to the states[253]. The principal aim of these policy changes was to reduce out-of-wedlock fertility, in particular teen pregnancies, and to increase the incentives for marriage (Blank 2002). The main broad intention was to increase the incentives to work, especially for women, to be entitled to receive public assistance in childcare and health insurance to low-income families.

All in all, however, the marital and fertility response to these policy changes of the nineties seems very weak. Nonetheless, findings from the literature on the effects of these policy reforms in the US are mixed, and very sensitive to the methodology of the study and its model specification (Blank 2002).

Immigration has been often cited as one of the main reasons for the rising period fertility rates in the first years 2000s in Europe (Goldstein et al. 2009) and in the US (Parrado 2011). Immigrant women have a higher fertility compared to natives' and when the share of immigrant in the composition of women in reproductive age increases, the period fertility rates also rise. However, the literature has also shown, for instance in the case of Hispanic women in the US (Parrado 2011) that this increase in fertility rates is artificial; it is due to their age at migration and to the fact that immigrant women tend to have children right after they arrive in the US. All in all, immigrant Hispanic women do not have completed fertility higher than native White American women (Parrado

[253] To cite an example, the Personal Responsibility and Work Opportunity Reconciliation Act (PRWORA) of 1996 replaced the Federal Aid to Families with Dependent Children Program (AFDC) – the primary cash-assistance program for low-income families -- with the Temporary Assistance for Needy Families (TANF) block grant. The same program also changed the structure of child-care assistance, creating a Child Care and Development Block Grant, based on which states where allowed to devote part of their TANF funds to child care (Blank 2002).

2011). However, clearly the Great Recession did have an impact on migration, reducing the flow of migrants to advanced economies, because of the job-market difficulties in those countries. The latter process also might have had an effect, at least on the period fertility rates analyzed in Chapter II, but for the sake of simplicity I preferred not to take the migration issue into consideration in this thesis.

All things considered, I acknowledge that both family welfare provisions and migration radically influence fertility behavior but their intrinsic complexity prevented me from taking them into consideration in my empirical models.

4. Future research

As mentioned throughout this thesis the literature and the empirical evidence on the fertility response to the recent Great Recession is still scarce. This is because western countries have just started to recover from the strong financial and economic shock that hit them at the end of 2007. Households still struggle with financial distress and high unemployment rates, and they are far from overcoming the economic insecurity generated by the crisis. The existence of so few studies on the Great Recession's consequences for childbearing, however, opens the door to multiple streams of research. As a result of my contributions and findings I have in mind four main feasible avenues for near-future studies.

The first main subject to explore is the role of the institutional context in moderating the impact of the recession on childbearing. As mentioned in the previous section, the importance of welfare provisions in shaping the economic incentives to childbearing but also the behavioral norms attached to the various family arrangements is paramount.

To go more in depth in analyzing the impact of the institutional structures and their interplay with the economic circumstances in shaping fertility behavior, a comparative study is necessary, and the European countries represent a natural term of comparison for the United States. Europe offers a wide array of welfare provisions and family policies that might buffer the impact of the economic insecurity generated by the crisis on fertility. Besides family policies European countries also differ in terms of their educational system, labor market characteristics, redistributive policies and, last but not least, in terms of cultural norms regarding gender equality, parenthood and family structures in general. Due to these different features the fertility response to business cycle fluctuations would be clearly different in Europe from the effect I identified in this thesis for the United States.

Moreover, as shown in Chapter II of this thesis, the Great Recession affected each country in a particular way. Exploiting this variation would allow one to grasp the effects of the different aspects of the recession - among those the ones I started to illustrate in the first empirical chapter of this thesis (macroeconomic structural conditions versus financial and economic uncertainty indicators) that influence childbearing behavior[254].

[254] The first study I plan to conduct as a follow up on this thesis is a replication of the analysis on the effect of the crisis on childlessness (Chapter V) using the EU Labor Force Survey, initially clustering countries in welfare state groups (Esping-Andersen 1990) to assess the different impact of the Great Recession on childlessness in each cluster. Secondly, if the dataset sample size is large enough I plan to select around five countries and compare the effects of the crisis on childlessness, mediated by the country-specific welfare policies, family provisions and labor market features.

A second empirical question for future research that would expand the results of this thesis concerns the impact of the crisis on higher parities. I limited my analysis to the transition to parenthood but, although previous evidence suggests that the effect for parents on the transition to higher-order births is limited, there is no empirical evidence on the recent crisis consequences for the second or third child. Also a study of this kind would shed light on the different mechanisms explaining how the economic incentives or disincentives apply to the first child compared to higher parities. The transition to parenthood is, as I also mentioned in this thesis, a clearly different life-course transition compared to the transition to higher-order births. Nonetheless it is still not clear from the existing evidence precisely how they differ and how differently each transition responds to economic opportunities and constraints.

The third stream of research that I would suggest starting from my investigation here concerns the application of causal inference to the study of recession and fertility. As I mention in Chapter V, design-based studies of fertility are mostly devoted to analyzing the impact of family-policy reforms on childbearing and on women's labor-market participation.

Moreover, only a handful of recent studies (Del Bono, Weber, and Winter-Ebmer 2014; Dehejia and Lleras-Muney 2004; McKenzie 2003) make the effort to use causal inference methods to study the effect of employment conditions of fertility. As I also explain in this thesis the relationship between working and childbearing behavior is affected by unobserved characteristics that might bias the estimate of the causal effect of one variable on the other, obtained in a traditional statistical setting.

It is fundamental therefore that future research focuses on finding alternative ways to measure the causal economic determinants of fertility, net of the selection effects generated by those unobserved characteristics. A practical example of this attempt might be - beyond the difference-in-difference approach I applied to the pseudo-panels in Chapter V of this thesis - the already-cited, *synthetic control* method developed by Abadie, Diamond and Hainmueller (2010, 2011, 2014). Both methods manage to build an alternative control group to be compared to the treatment group in cases where it seems more cumbersome to identify one.

A final issue that I treat in this thesis but that could be further and specifically expanded is how birth rates respond to economic uncertainty. This avenue of research I have in mind is also linked to the causal inference approach I referred to in the previous paragraph. The Great Recession is in fact an exceptional source of massive economic and financial insecurity that gives researchers the opportunity to study the fertility reaction to uncertainty more *closely* and more *causally*.

For instance, as I describe in the thesis, the sovereign debt crisis (2011-2012) caused financial insecurity to rise in Southern European countries. The IMF identified episodes of acute *financial stress* in Italy, Spain and Greece in terms of exceptional spikes in the daily spread between their governments' bonds and the Germans (IMF 2012) between January 2007 and June 2012.

A first study on the fertility response to financial uncertainty could look at the consequences for aggregate birth rates using those random financial shocks in the attempt to limit the impact of unobserved heterogeneity on the estimates and go more in the direction of a causal effect of financial uncertainty on births. Using monthly General Fertility Rates (GFR) time series in Italy, Spain and Greece, in a country fixed effect model (and controlling for births' seasonality) I can assess the effect on the GFR nine-to-ten months after the financial shocks. To solve the problem of long-lasting periods of insecurity where there are many financial close-ranged shocks I propose to look at Google trends. The term 'spread' in those months came into common use in the media and public debate (compared to other technical words like bailout, subprime or bankruptcy); therefore, the search statistics for the term 'spread' on Google should indicate the hot dates when insecurity peaked[255].

A second study could look more specifically at how economic uncertainty is subjectively perceived. Studies in the US (Lesthaege and Neidert 2009) show that there is a relationship between political preferences, voting behavior and fertility. During the crisis, the negative correlation between unemployment and fertility rates was smaller in states where a greater share of citizen voted for Obama in the elections of 2008 (Morgan et al. 2011). This result points to a differential effect on fertility depending on the partisan perception of the crisis. The argument is that the Obama election elicited optimism in those states where the majority of the voters supported his election. This optimistic climate dampened the negative effect of the recession on fertility by altering the perception of uncertainty. To my knowledge, there is no similar study conducted in Europe.

The Italian case during the European Elections of 2014 is an interesting one to address the research question of whether the perception of economic uncertainty changes the effect on fertility rates of the aggregate economic conditions[256].

The crisis in Italy was severe, with unemployment exploding and remaining high for many years. The 2014 elections in Italy are peculiar since Renzi's party won with 40% of the votes, a very large share for Italian elections. Renewal was a major issue on which Renzi built his victory. The promise of change generated optimism among citizens who supported his victory and might have influenced their perception of the crisis[257].

Despite the larger coverage of the welfare state in Italy compared to the US[258], policy provisions to reconcile family and work are few and childcare has to be purchased on the market (though at a lower cost than in the US) or, in most cases, it has to be provided by the extended family (i.e., grandparents).

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[255] And indeed they do: from a preliminary analysis of Google trends, search for the term 'spread' in Italy peaked in November 2011.

[256] For example, following Morgan et al. 2011 a difference-in-difference approach could be applied to a province (110 in Italy) fixed effect model where the monthly fertility rate variation 2011/2015 is regressed on the monthly unemployment rate variation 2010/2014, interacted with the provincial PD votes share in the 2014 election.

[257] This claim is supported by the fact that the main target of Renzi's campaign were the young who were, first, the most affected by unemployment during the recession and, second, those proven to have postponed childbearing the most due to the crisis.

[258]The labor market structure in Italy is much more rigid due to the insiders *versus* outsiders dichotomy in employment conditions (see Barbieri and Scherer 2009) and female labor force participation is still low compared to the US. Italy is a very low-fertility country; it has strong traditional family ties and a still-diffused male breadwinner model (Impicciatore and Billari 2012).

This suggests that results would be similar in the two countries; however, the US and Italy differ a great deal with respect to interest in politics. Results on the 2005-09 wave of the World Value Survey (WVS) show that while in the US 15.5% and 44.5% are respectively very and somehow interested in politics, these percentages in Italy are of 9% and 29%. This might counterbalance the importance of the 2014 election results and reduce the 'optimism' effect of Renzi's victory on buffering the negative effect of unemployment on fertility. This factor can be controlled for using the WVS estimates.

5. Conclusions

This thesis aimed to identify the relationship between the Great Recession and the recently witnessed decline in births, and to test, at the micro-level, some of the mechanisms of transmission of uncertainty from the employment to the family domains.

After establishing that there is a negative correlation at the aggregate level between objective job market conditions but also financial uncertainty indicators of the crisis and period fertility rates both in the United States and in Europe, this study focuses on how employment insecurity affects the transition to the first child, analyzing individual level data from the US in the period 2003-2011.

The two central chapters of this thesis – Chapters III-IV – investigate this issue from two different perspectives. The former analyzes the effects for the probability of parenthood of couples' employment dynamics; the latter analyzes how likely it is that women will transition to motherhood, given their socioeconomic occupational mobility with respect to their family of origin.

The main finding of these chapters is that there is, at the micro-level, a negative effect of employment insecurity on the probability of first birth. Both looking at the couples' and at women's perspectives, being in a dual-earner couple, or being a woman in a non-downward mobile occupation increases the likelihood of first childbearing. Couples where both partners work are more likely to have their first child than traditional male-breadwinner couples. Likewise, upward (or immobile) mobile women are more likely to become mothers than downward mobile or non-working women. My findings thus suggest that parenthood is linked to economic and employment security through an income mechanism and not through an opportunity cost effect.

This result implies that in the last ten years in the US and during the Great Recession the direct cost of childbearing overcame the opportunity and conciliation costs of parenthood. In a country like the US where family policies are almost inexistent and the costs of childbearing are concentrated on the parents, a satisfying position in the labor market for women and a sizeable household income achieved when both partners work are necessary conditions to form a family.

Finally, this thesis also contributes to two other crucial aspects of the debate on the socio-economic determinants of fertility: first, the *causal* effect of the recession on the extensive margin of fertility, i.e. childlessness, and, second, the *tempo* or *quantum* response of fertility to short-term economic shocks. Applying an innovative research design I show that there is a positive causal effect of the Great Recession on permanent childlessness. Net of selection and unobserved heterogeneity, childlessness among women around 40 years old increased around 2-3%. Therefore, women close to the end of their reproductive lives postponed their first child during the economic and financial crisis in the US at a rate comparable to women in their thirties, and there is no evidence that they recuperated those births after the recession.

This is a key finding of this thesis because the existing literature on the effect of economic shocks on fertility up to now only identified a temporary delaying effect on first birth among young women. My findings instead point to an additional permanent negative effect of the Great Recession on births to older women.

The fact that these American women, estimated at around eighty thousand, will end up involuntarily childless due to the Great Recession has crucial negative societal implications. First, rising childlessness further reduces fertility rates in societies that already face the challenge of population decline and ageing. Second, population ageing increases the dependency ratio, burdening public spending and generating intergenerational imbalances in the distribution of economic resources.

Finally, childless couples that would like to have a child but for some reason cannot, suffer from a welfare deficit and they represent a large public policy concern and public cost. Childless old individuals generate a costly demand for formal care, especially because old individuals are more likely to be socially isolated (Bachrach 1980; Koropeckyj-Cox and Call 2007; Connidis 2010) and institutionalized (Rowland 1998) if they are childless.

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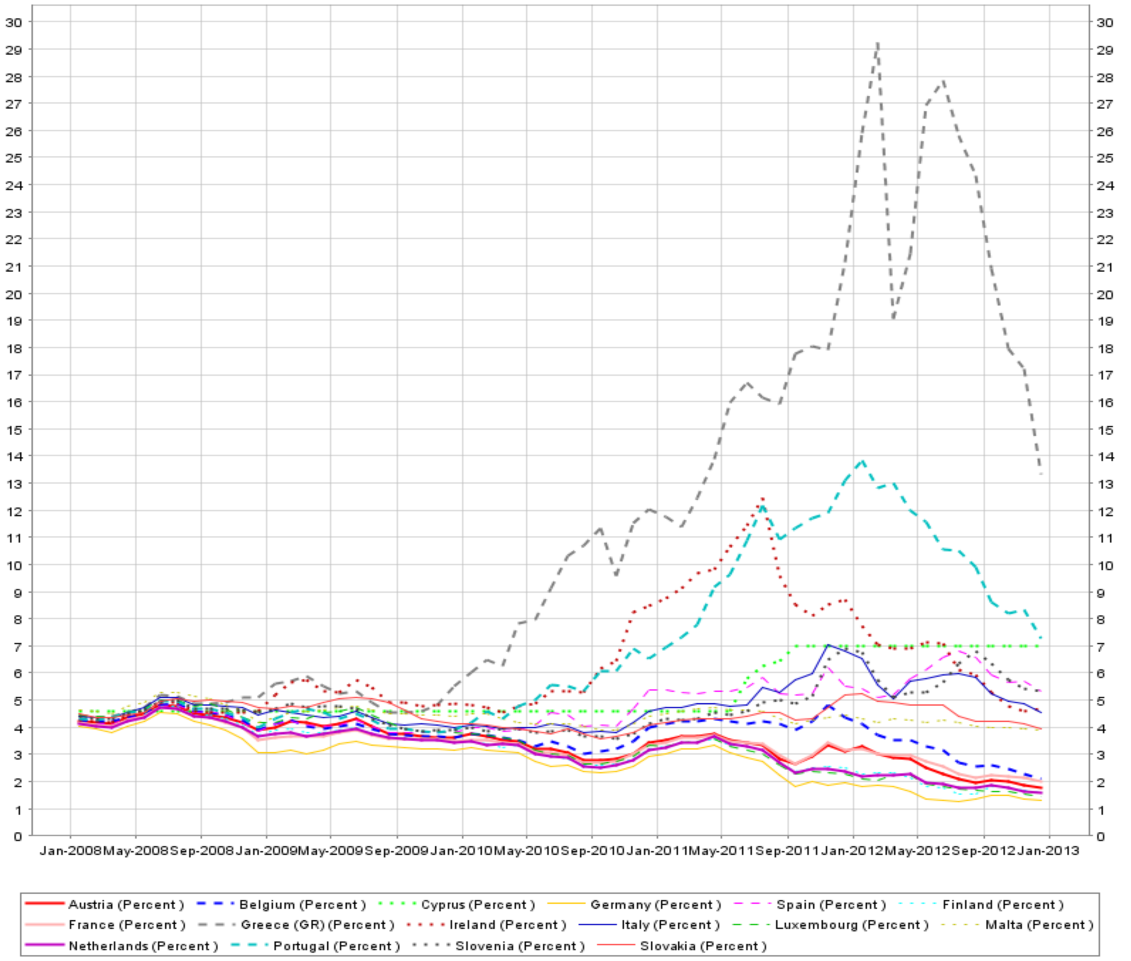
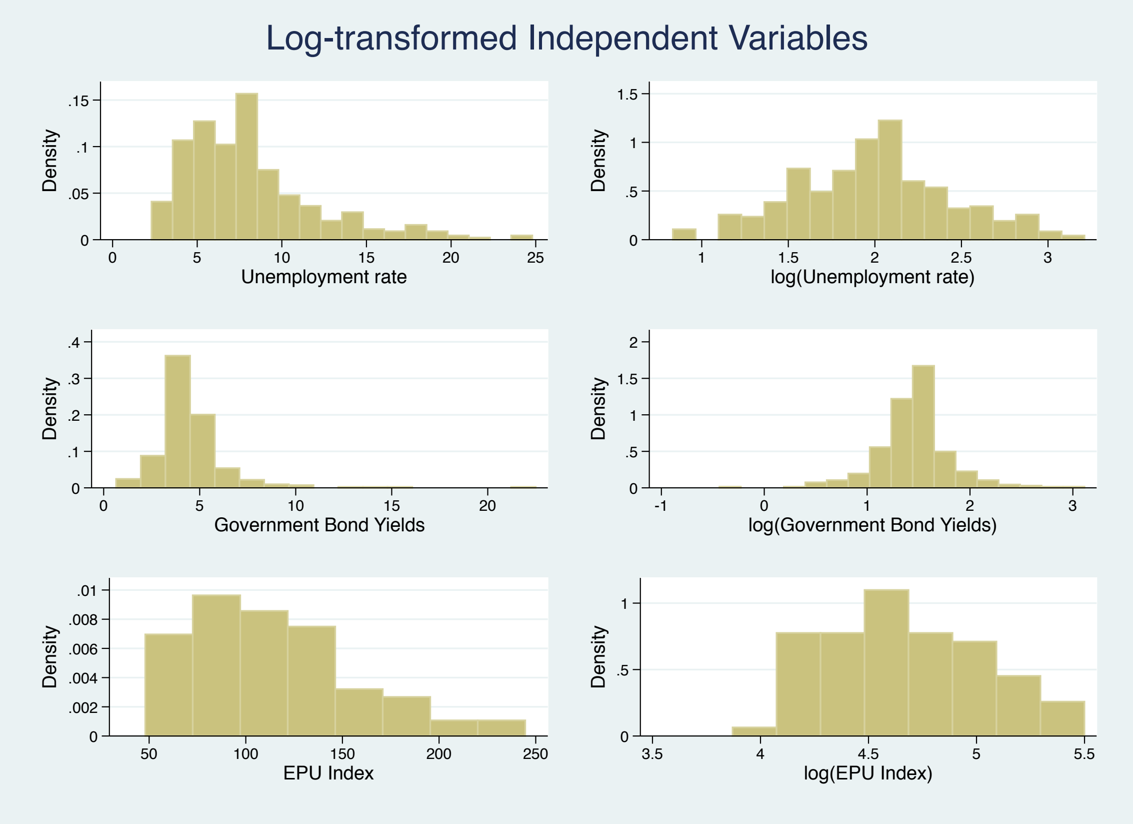
APPENDIX 1

Figure A1.1: Long-term government bond yield in Eurozone countries (2009-2012)



Source: ECB. Secondary market yields of government bonds with maturities close to 10years. All Eurozone except Estonia.

Figure A1.2: Density distribution of independent variables and log-transformed distribution.



Source: elaboration of the author based on data from Eurostat, ECB, Bank of England, OECD and Federal Reserve Economic Data (St. Louis FED), US National Vital Statistics and US Treasury. EPU index by Beker et al. (2012).

Table A1.1: The Great Recession indicators effect on Total Fertility Rate in Europe and the US (2003-2013). Country and Country-year Fixed effect models.

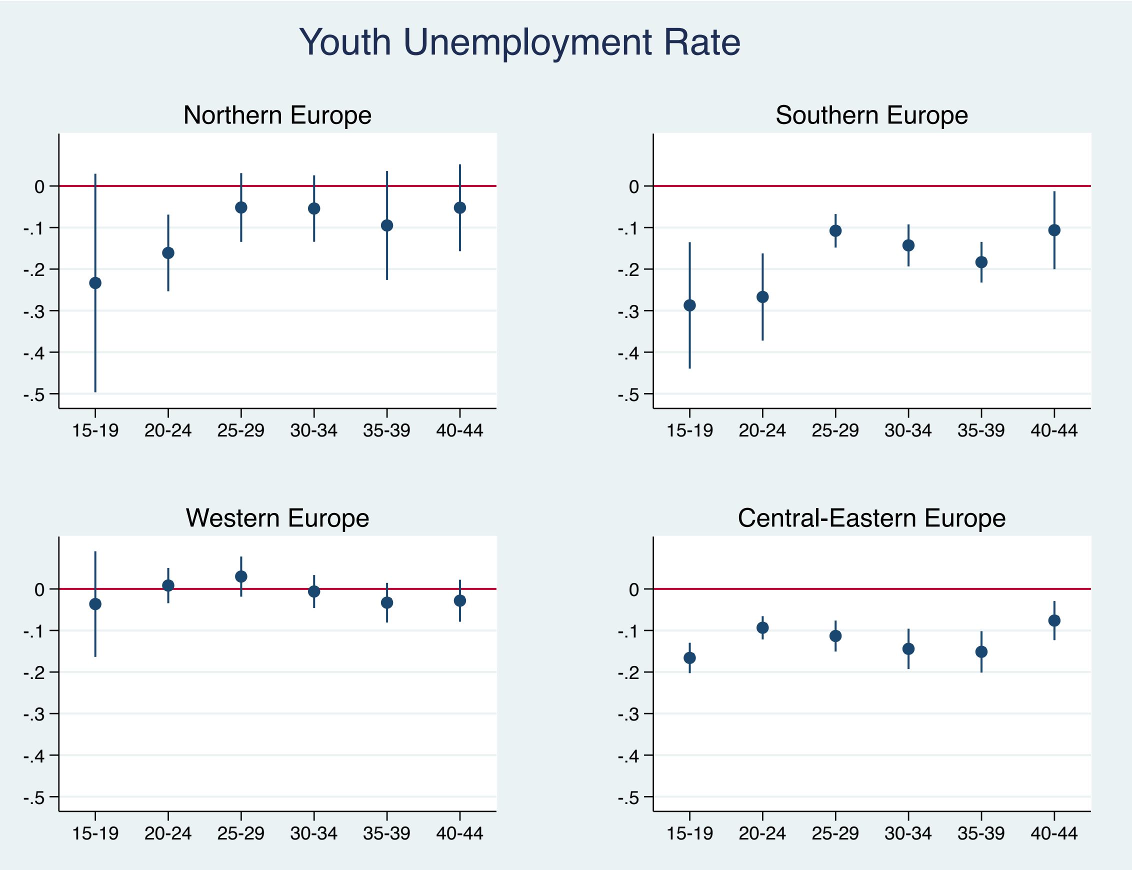
	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)
Unemployment rate	-0.087***				-0.064***
	(-0.106 - -0.068)				(-0.090 - -0.038)
Youth Unemployment Rate		-0.086***			
		(-0.108 - -0.065)			
10 Years Govt. bond yield			0.010		0.043**
			(-0.014 - 0.034)		(0.010 - 0.076)
EPU Index (annual average)				-0.043***	-0.021***
				(-0.060 - -0.026)	(-0.036 - -0.006)
Year	0.003**	0.005***	0.004***	-0.009***	-0.004**
	(0.000 - 0.006)	(0.001 - 0.008)	(0.001 - 0.006)	(-0.012 - -0.005)	(-0.006 - -0.001)
Belgium	-2.628	-0.892	-2.883		
	(-18.365 - 13.110)	(-17.020 - 15.236)	(-17.292 - 11.526)		
Bulgaria	-26.751***	-25.923***	-11.081		
	(-34.839 - -18.664)	(-35.110 - -16.737)	(-28.761 - 6.599)		
Croatia	-1.324	-0.529			
	(-10.388 - 7.739)	(-10.817 - 9.759)			
Cyprus	10.650**	11.181*	27.323***		
	(1.127 - 20.173)	(-0.404 - 22.767)	(14.991 - 39.654)		
Czech Republic	-33.137***	-32.646***	-35.393***		
	(-50.308 - -15.967)	(-49.868 - -15.424)	(-53.769 - -17.016)		
Denmark	0.126	0.398	7.931		
	(-10.370 - 10.621)	(-11.970 - 12.766)	(-4.005 - 19.867)		
Estonia	-19.402	-15.658			
	(-46.025 - 7.220)	(-43.803 - 12.488)			
Finland	7.776	9.745	5.215		
	(-3.198 - 18.750)	(-2.618 - 22.109)	(-5.608 - 16.039)		
France	-12.681***	-11.703**	-9.834**	12.203*	-15.137***
	(-21.576 - -3.786)	(-22.069 - -1.337)	(-17.684 - -1.985)	(-1.977 - 26.383)	(-25.818 - -4.456)
Germany	6.804*	6.323	-3.876	23.484***	
	(-0.717 - 14.324)	(-2.963 - 15.608)	(-10.652 - 2.901)	(9.730 - 37.239)	
Greece	-30.291***	-25.167***	-14.582		
	(-41.566 - -19.017)	(-38.096 - -12.238)	(-34.074 - 4.910)		
Hungary	-10.058*	-8.044	4.749		
	(-21.945 - 1.829)	(-21.866 - 5.779)	(-7.987 - 17.485)		
Iceland	-6.403	5.630	11.005		
	(-27.678 - 14.872)	(-19.612 - 30.872)	(-9.654 - 31.663)		
Ireland	-36.599***	-34.187***	-8.027		
	(-53.763 - -19.435)	(-51.740 - -16.634)	(-20.577 - 4.523)		
Italy	-13.196***	-13.270***	-9.412**	16.372**	-8.224
	(-19.732 - -6.661)	(-21.196 - -5.343)	(-17.602 - -1.223)	(3.674 - 29.069)	(-19.094 - 2.647)
Latvia	-18.326**	-16.216**	-6.523		
	(-32.853 - -3.799)	(-31.046 - -1.386)	(-26.727 - 13.681)		
Lithuania	-55.487***	-54.546***	-48.531***		
	(-72.193 - -38.780)	(-71.326 - -37.766)	(-57.672 - -39.390)		
Luxemburg	11.795*	11.942	19.570***		
	(-1.359 - 24.949)	(-3.271 - 27.156)	(11.462 - 27.678)		
Malta	10.620*	15.807**	8.641		
	(-1.792 - 23.031)	(2.620 - 28.994)	(-3.201 - 20.483)		
Netherlands	4.307	6.906	6.433	32.689***	3.551
	(-3.680 - 12.295)	(-3.330 - 17.142)	(-2.239 - 15.105)	(16.873 - 48.504)	(-5.120 - 12.222)
Norway	8.727	12.381	3.651		
	(-6.679 - 24.134)	(-3.451 - 28.212)	(-11.772 - 19.074)		
Poland	4.499	3.360	-11.013*		
	(-5.573 - 14.571)	(-7.202 - 13.922)	(-24.082 - 2.055)		
Portugal	-5.585	0.325	12.273		
	(-30.928 - 19.759)	(-26.083 - 26.732)	(-10.110 - 34.656)		

Romania	-23.533	-24.396*	-112.863***		
	(-52.127 - 5.060)	(-52.861 - 4.068)	(-116.950 - -108.776)		
Slovakia	-18.062**	-19.311***	-23.586***		
	(-31.981 - -4.144)	(-33.875 - -4.748)	(-39.337 - -7.834)		
Slovenia	-58.619***	-50.865***	-53.759***		
	(-70.103 - -47.134)	(-61.849 - -39.882)	(-69.738 - -37.781)		
Spain	-25.650***	-22.827***	-7.619	20.718**	-15.062**
	(-37.077 - -14.223)	(-34.894 - -10.759)	(-18.196 - 2.957)	(4.755 - 36.681)	(-28.046 - -2.078)
Sweden	-20.394***	-18.344**	-16.487***		
	(-33.818 - -6.971)	(-33.591 - -3.097)	(-28.404 - -4.570)		
Switzerland	-15.287***	3.115	-13.930***		
	(-23.996 - -6.578)	(-5.234 - 11.464)	(-19.622 - -8.238)		
UK	-31.089***	-28.826***	-20.478***		-34.504***
	(-45.532 - -16.646)	(-44.026 - -13.626)	(-33.623 - -7.332)		(-48.004 - -21.005)
US	19.584***	24.921***	29.780***	54.968***	18.239***
	(10.974 - 28.195)	(14.715 - 35.126)	(19.422 - 40.137)	(40.934 - 69.002)	(9.095 - 27.383)
Belgium*year	0.001	0.001	0.002		
	(-0.006 - 0.009)	(-0.007 - 0.009)	(-0.006 - 0.009)		
Bulgaria*year	0.013***	0.013***	0.006		
	(0.009 - 0.017)	(0.008 - 0.018)	(-0.003 - 0.014)		
Croatia*year	0.001	0.000			
	(-0.004 - 0.005)	(-0.005 - 0.005)			
Cyprus*year	-0.005**	-0.006*	-0.014***		
	(-0.010 - -0.001)	(-0.011 - 0.000)	(-0.020 - -0.007)		
Czech Republic*year	0.017***	0.016***	0.018***		
	(0.008 - 0.025)	(0.008 - 0.025)	(0.008 - 0.027)		
Denmark*year	0.000	-0.000	-0.004		
	(-0.005 - 0.005)	(-0.006 - 0.006)	(-0.010 - 0.002)		
Estonia*year	0.010	0.008			
	(-0.004 - 0.023)	(-0.006 - 0.022)			
Finland*year	-0.004	-0.005	-0.002		
	(-0.009 - 0.002)	(-0.011 - 0.001)	(-0.008 - 0.003)		
France*year	0.007***	0.006**	0.005**	0.021***	0.017***
	(0.002 - 0.011)	(0.001 - 0.011)	(0.001 - 0.009)	(0.017 - 0.026)	(0.012 - 0.021)
Germany*year	-0.003*	-0.003	0.002	0.015***	0.009***
	(-0.007 - 0.000)	(-0.008 - 0.001)	(-0.001 - 0.005)	(0.011 - 0.020)	(0.004 - 0.013)
Greece*year	0.015***	0.013***	0.007		
	(0.010 - 0.021)	(0.006 - 0.019)	(-0.002 - 0.017)		
Hungary*year	0.005*	0.004	-0.002		
	(-0.001 - 0.011)	(-0.003 - 0.011)	(-0.009 - 0.004)		
Iceland*year	0.003	-0.003	-0.005		
	(-0.007 - 0.014)	(-0.015 - 0.010)	(-0.016 - 0.005)		
Ireland*year	0.018***	0.017***	0.004		
	(0.010 - 0.027)	(0.008 - 0.026)	(-0.002 - 0.010)		
Italy*year	0.007***	0.007***	0.005**	0.019***	0.013***
	(0.003 - 0.010)	(0.003 - 0.011)	(0.001 - 0.009)	(0.015 - 0.023)	(0.009 - 0.017)
Latvia*year	0.009**	0.008**	0.003		
	(0.002 - 0.016)	(0.001 - 0.015)	(-0.007 - 0.013)		
Lithuania*year	0.028***	0.027***	0.024***		
	(0.019 - 0.036)	(0.019 - 0.036)	(0.020 - 0.029)		
Luxemburg*year	-0.006*	-0.006	-0.010***		
	(-0.012 - 0.001)	(-0.013 - 0.002)	(-0.014 - -0.006)		
Malta*year	-0.005*	-0.008**	-0.004		
	(-0.011 - 0.001)	(-0.014 - -0.001)	(-0.010 - 0.002)		
Netherlands*year	-0.002	-0.003	-0.003	0.011***	0.007***
	(-0.006 - 0.002)	(-0.008 - 0.002)	(-0.007 - 0.001)	(0.005 - 0.017)	(0.004 - 0.010)
Norway*year	-0.004	-0.006	-0.002		
	(-0.012 - 0.003)	(-0.014 - 0.002)	(-0.009 - 0.006)		
Poland*year	-0.002	-0.002	0.005		
	(-0.007 - 0.003)	(-0.007 - 0.004)	(-0.001 - 0.012)		
Portugal*year	0.003	-0.000	-0.006		

	(-0.010 - 0.015)	(-0.013 - 0.013)	(-0.017 - 0.005)		
Romania*year	0.012	0.012*	0.056***		
	(-0.002 - 0.026)	(-0.002 - 0.026)	(0.054 - 0.058)		
Slovakia*year	0.009**	0.010***	0.012***		
	(0.002 - 0.016)	(0.002 - 0.017)	(0.004 - 0.020)		
Slovenia*year	0.029***	0.025***	0.027***		
	(0.023 - 0.035)	(0.020 - 0.031)	(0.019 - 0.035)		
Spain*year	0.013***	0.011***	0.004	0.017***	0.016***
	(0.007 - 0.019)	(0.005 - 0.017)	(-0.001 - 0.009)	(0.011 - 0.023)	(0.011 - 0.021)
Sweden*year	0.010***	0.009**	0.008***		
	(0.004 - 0.017)	(0.002 - 0.017)	(0.002 - 0.014)		
Switzerland*year	0.008***	-0.002	0.007***		
	(0.003 - 0.012)	(-0.006 - 0.003)	(0.004 - 0.010)		
UK*year	0.016***	0.015***	0.010***	0.027***	0.026***
	(0.008 - 0.023)	(0.007 - 0.022)	(0.004 - 0.017)	(0.020 - 0.034)	(0.021 - 0.031)
US*year	-0.010***	-0.012***	-0.015***		
	(-0.014 - -0.005)	(-0.017 - -0.007)	(-0.020 - -0.010)		
Constant	-5.447**	-8.949**	-7.153***	-36.714***	-10.309**
	(-10.893 - -0.002)	(-15.945 - -1.954)	(-11.756 - -2.551)	(-49.315 - -24.114)	(-19.675 - -0.943)
N	352	343	318	76	76
R-squared	0.967	0.965	0.965	0.989	0.993

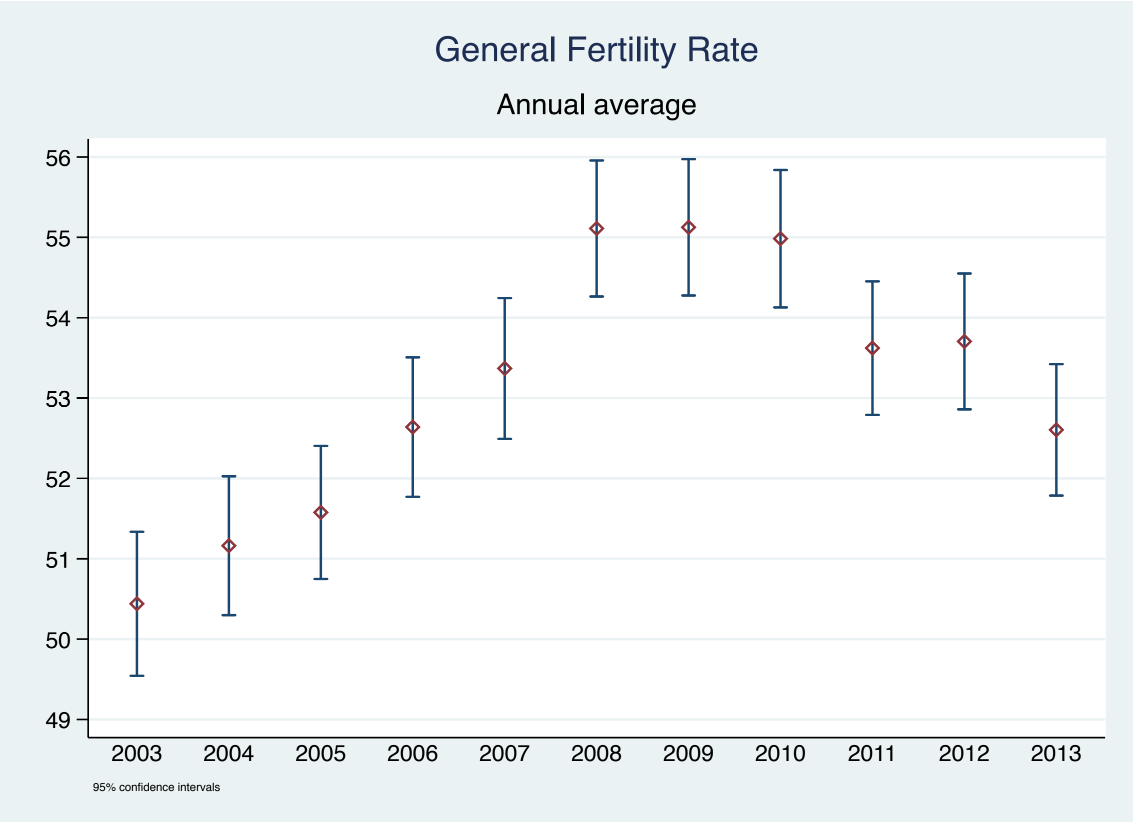
Source: elaboration of the author based on data from Eurostat, ECB, Bank of England, OECD and Federal Reserve Economic Data (St. Louis FED), US National Vital Statistics and US Treasury. EPU index by Beker et al. (2012).
Note: Robust CI in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Figure A1.3: Youth unemployment rate effect on Age-Specific Fertility Rates. Europe.



Source: elaboration of the author based on data from Eurostat, ECB, Bank of England, OECD and Federal Reserve Economic Data (St. Louis FED), US National Vital Statistics and US Treasury. EPU index by Beker et al. (2012).
Country clusters: Western Europe (Austria, Belgium, France, Germany, Ireland, Luxembourg, Netherlands, Switzerland, UK); Central-Eastern Europe (Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia); Northern Europe (Denmark, Finland, Iceland, Norway, Sweden) and Southern Europe (Cyprus, Greece, Italy, Malta, Portugal, Spain).

Figure A1.4: General Fertility Rate (Annual Average) (2003-2013).



Source: elaboration of the author based on data from Eurostat.

Table A1.2: Elasticity of monthly fertility rates to macroeconomic indicators of the Great Recession. 31 European Countries plus the US. OLS with Country and Month fixed effects (2003-2013).

	Model (1)	Model (2)	Model (3)	Model (4)
Unemployment rate	-0.085*** (-0.092 - -0.077)			
10 Years Govt. bond yield		-0.008* (-0.017 - 0.000)		
Bond Yields Spread			-0.006*** (-0.009 - -0.004)	
EPU Index (annual average)				-0.011*** (-0.018 - -0.004)
Year	0.007*** (0.006 - 0.008)	0.004*** (0.003 - 0.005)	0.005*** (0.004 - 0.007)	0.003*** (0.001 - 0.004)
Feb	-0.072*** (-0.112 - -0.033)	-0.072*** (-0.109 - -0.036)	-0.070*** (-0.106 - -0.035)	-0.092*** (-0.111 - -0.073)
Mar	-0.009 (-0.045 - 0.028)	-0.008 (-0.043 - 0.026)	-0.005 (-0.039 - 0.029)	-0.007 (-0.045 - 0.030)
Apr	-0.042** (-0.082 - -0.002)	-0.043** (-0.080 - -0.005)	-0.040** (-0.078 - -0.003)	-0.127*** (-0.165 - -0.089)
Ma	0.011 (-0.026 - 0.048)	0.010 (-0.025 - 0.045)	0.011 (-0.023 - 0.046)	0.001 (-0.036 - 0.038)
Jun	0.013 (-0.025 - 0.052)	0.012 (-0.024 - 0.049)	0.015 (-0.021 - 0.050)	0.062*** (0.022 - 0.103)
Jul	0.092*** (0.050 - 0.133)	0.091*** (0.050 - 0.131)	0.093*** (0.052 - 0.134)	0.040** (0.005 - 0.075)
Aug	0.064*** (0.029 - 0.100)	0.063*** (0.029 - 0.098)	0.066*** (0.032 - 0.100)	0.021 (-0.012 - 0.053)
Sept	0.075*** (0.036 - 0.114)	0.074*** (0.036 - 0.112)	0.076*** (0.038 - 0.115)	0.033* (-0.003 - 0.069)
Oct	0.034* (-0.003 - 0.072)	0.031* (-0.005 - 0.068)	0.034* (-0.003 - 0.071)	0.033*** (0.014 - 0.053)
Nov	-0.049** (-0.091 - -0.008)	-0.052*** (-0.091 - -0.013)	-0.051** (-0.091 - -0.012)	-0.008 (-0.040 - 0.025)
Dec	-0.025 (-0.062 - 0.012)	-0.028 (-0.065 - 0.009)	-0.024 (-0.062 - 0.015)	-0.018 (-0.058 - 0.023)
Belgium	0.309*** (0.272 - 0.347)	0.271*** (0.235 - 0.307)	0.275*** (0.240 - 0.310)	
Bulgaria	0.148*** (0.108 - 0.188)	0.094*** (0.045 - 0.143)	0.104*** (0.056 - 0.151)	
Croatia	0.204*** (0.159 - 0.249)	0.141*** (0.087 - 0.195)	0.151*** (0.097 - 0.205)	
Cyprus	0.082*** (0.046 - 0.118)	0.071*** (0.033 - 0.110)	0.081*** (0.044 - 0.119)	
Czech Republic	0.100*** (0.054 - 0.146)	0.074*** (0.023 - 0.126)	0.079*** (0.027 - 0.131)	
Denmark	0.232*** (0.185 - 0.279)	0.224*** (0.176 - 0.273)	0.224*** (0.175 - 0.273)	
Estonia	0.174*** (0.124 - 0.223)			
Finland	0.311*** (0.273 - 0.348)	0.271*** (0.234 - 0.308)	0.271*** (0.234 - 0.307)	
France	0.409*** (0.374 - 0.444)	0.360*** (0.327 - 0.393)	0.361*** (0.329 - 0.394)	0.163*** (0.143 - 0.182)
Germany	-0.034 (-0.095 - 0.028)	-0.074*** (-0.128 - -0.019)		-0.272*** (-0.316 - -0.227)
Greece	0.137*** (0.091 - 0.183)	0.067** (0.013 - 0.121)	0.076*** (0.022 - 0.129)	
Hungary	0.068*** (0.029 - 0.107)	0.030 (-0.012 - 0.071)	0.045** (0.003 - 0.087)	
Iceland	0.385*** (0.332 - 0.438)	0.400*** (0.353 - 0.446)	0.415*** (0.364 - 0.466)	
Ireland	0.484*** (0.401 - 0.567)	0.451*** (0.383 - 0.519)	0.466*** (0.395 - 0.538)	
Italy	0.106*** (0.068 - 0.145)	0.068*** (0.028 - 0.107)	0.075*** (0.037 - 0.113)	-0.133*** (-0.160 - -0.107)
Latvia	0.113*** (0.053 - 0.172)	0.046 (-0.021 - 0.113)	0.048 (-0.020 - 0.116)	

Lithuania	0.061* (-0.008 - 0.130)	0.006 (-0.055 - 0.067)	0.013 (-0.049 - 0.075)	
Luxemburg	0.197*** (0.153 - 0.241)	0.201*** (0.159 - 0.244)	0.197*** (0.148 - 0.245)	
Malta	0.140*** (0.051 - 0.229)	0.116** (0.026 - 0.206)	0.126*** (0.036 - 0.216)	
Netherlands	0.202*** (0.162 - 0.242)	0.202*** (0.164 - 0.239)	0.200*** (0.164 - 0.237)	
Norway	0.356*** (0.186 - 0.526)	0.387*** (0.217 - 0.558)	0.395*** (0.224 - 0.567)	
Poland	0.132*** (0.093 - 0.172)	0.063*** (0.018 - 0.109)	0.077*** (0.033 - 0.121)	
Portugal	0.056** (0.003 - 0.110)	-0.002 (-0.059 - 0.055)	0.003 (-0.051 - 0.057)	
Romania	0.077*** (0.030 - 0.124)	0.060** (0.010 - 0.110)	0.074*** (0.023 - 0.124)	
Slovakia	0.136*** (0.080 - 0.191)	0.050* (-0.007 - 0.107)	0.058** (0.001 - 0.115)	
Slovenia	0.125*** (0.058 - 0.192)	0.103*** (0.034 - 0.173)	0.125*** (0.055 - 0.194)	
Spain	0.155*** (0.119 - 0.190)	0.069*** (0.029 - 0.109)	0.072*** (0.035 - 0.109)	-0.131*** (-0.157 - -0.106)
Sweden	0.317*** (0.279 - 0.354)	0.284*** (0.248 - 0.320)	0.283*** (0.247 - 0.320)	
Switzerland	0.059*** (0.023 - 0.095)	0.070*** (0.033 - 0.107)		
UK	0.312*** (0.265 - 0.359)	0.295*** (0.252 - 0.337)	0.301*** (0.261 - 0.341)	0.098*** (0.063 - 0.132)
US	0.351*** (0.310 - 0.391)	0.328*** (0.281 - 0.375)	0.336*** (0.277 - 0.395)	0.128*** (0.095 - 0.161)
BE*Feb	-0.019 (-0.065 - 0.026)	-0.020 (-0.062 - 0.023)	-0.022 (-0.063 - 0.019)	
BE*Mar	0.010 (-0.034 - 0.054)	0.010 (-0.032 - 0.051)	0.007 (-0.034 - 0.048)	
BE*Apr	0.009 (-0.038 - 0.057)	0.009 (-0.037 - 0.056)	0.006 (-0.040 - 0.052)	
BE*Ma	-0.016 (-0.062 - 0.030)	-0.016 (-0.062 - 0.029)	-0.018 (-0.063 - 0.027)	
BE*Jun	-0.012 (-0.056 - 0.032)	-0.012 (-0.055 - 0.031)	-0.014 (-0.057 - 0.029)	
BE*Jul	-0.046* (-0.093 - 0.001)	-0.046* (-0.094 - 0.001)	-0.049** (-0.096 - -0.001)	
BE*Aug	-0.024 (-0.066 - 0.018)	-0.023 (-0.064 - 0.018)	-0.026 (-0.066 - 0.015)	
BE*Sept	-0.057** (-0.103 - -0.010)	-0.056** (-0.102 - -0.011)	-0.058** (-0.104 - -0.013)	
BE*Oct	-0.017 (-0.063 - 0.029)	-0.018 (-0.064 - 0.027)	-0.021 (-0.067 - 0.025)	
BE*Nov	-0.008 (-0.057 - 0.040)	-0.010 (-0.057 - 0.037)	-0.010 (-0.057 - 0.037)	
BE*Dec	0.011 (-0.033 - 0.056)	0.008 (-0.035 - 0.052)	0.006 (-0.040 - 0.051)	
BU*Feb	-0.031 (-0.081 - 0.018)	-0.031 (-0.092 - 0.030)	-0.036 (-0.095 - 0.024)	
BU*Mar	-0.017 (-0.064 - 0.029)	-0.017 (-0.075 - 0.041)	-0.021 (-0.078 - 0.035)	
BU*Apr	-0.014 (-0.064 - 0.037)	-0.013 (-0.074 - 0.049)	-0.014 (-0.074 - 0.046)	
BU*Ma	-0.040* (-0.088 - 0.007)	-0.039 (-0.098 - 0.020)	-0.039 (-0.096 - 0.019)	
BU*Jun	-0.020 (-0.069 - 0.029)	-0.018 (-0.080 - 0.044)	-0.018 (-0.079 - 0.042)	
BU*Jul	-0.014 (-0.066 - 0.038)	-0.012 (-0.079 - 0.054)	-0.013 (-0.078 - 0.052)	
BU*Aug	-0.007 (-0.053 - 0.038)	-0.006 (-0.065 - 0.054)	-0.007 (-0.065 - 0.051)	
BU*Sept	-0.038 (-0.090 - 0.014)	-0.036 (-0.103 - 0.031)	-0.036 (-0.102 - 0.030)	
BU*Oct	-0.048* (-0.099 - 0.003)	-0.043 (-0.110 - 0.023)	-0.043 (-0.108 - 0.023)	
BU*Nov	-0.040	-0.039	-0.037	

	(-0.098 - 0.018)	(-0.109 - 0.032)	(-0.107 - 0.032)
BU*Dec	-0.026	-0.024	-0.026
	(-0.080 - 0.028)	(-0.092 - 0.045)	(-0.094 - 0.043)
CR*Feb	-0.031	-0.036	-0.037
	(-0.085 - 0.023)	(-0.101 - 0.030)	(-0.102 - 0.027)
CR*Mar	-0.047*	-0.058*	-0.061*
	(-0.102 - 0.008)	(-0.122 - 0.007)	(-0.125 - 0.004)
CR*Apr	-0.072**	-0.082**	-0.083**
	(-0.127 - -0.016)	(-0.149 - -0.015)	(-0.150 - -0.016)
CR*May	-0.078***	-0.083***	-0.083***
	(-0.132 - -0.025)	(-0.145 - -0.021)	(-0.145 - -0.022)
CR*Jun	-0.087***	-0.097***	-0.098***
	(-0.139 - -0.034)	(-0.161 - -0.033)	(-0.162 - -0.033)
CR*Jul	-0.048*	-0.040	-0.040
	(-0.103 - 0.007)	(-0.106 - 0.026)	(-0.107 - 0.026)
CR*Aug	-0.057**	-0.056*	-0.056*
	(-0.106 - -0.008)	(-0.120 - 0.008)	(-0.121 - 0.008)
CR*Sept	-0.027	-0.030	-0.030
	(-0.079 - 0.025)	(-0.094 - 0.035)	(-0.094 - 0.035)
CR*Oct	-0.022	-0.016	-0.016
	(-0.071 - 0.027)	(-0.075 - 0.043)	(-0.076 - 0.044)
CR*Nov	-0.004	0.001	0.002
	(-0.058 - 0.049)	(-0.063 - 0.065)	(-0.063 - 0.067)
CR*Dec	-0.012	-0.006	-0.009
	(-0.068 - 0.044)	(-0.076 - 0.064)	(-0.080 - 0.063)
CY*Feb	-0.060**	-0.061**	-0.063**
	(-0.110 - -0.010)	(-0.118 - -0.004)	(-0.120 - -0.007)
CY*Mar	-0.018	-0.019	-0.024
	(-0.066 - 0.030)	(-0.075 - 0.038)	(-0.084 - 0.035)
CY*Apr	-0.085***	-0.086***	-0.094***
	(-0.138 - -0.033)	(-0.142 - -0.031)	(-0.150 - -0.038)
CY*May	-0.104***	-0.104***	-0.106***
	(-0.152 - -0.056)	(-0.153 - -0.056)	(-0.155 - -0.057)
CY*Jun	-0.034	-0.036	-0.037
	(-0.088 - 0.020)	(-0.096 - 0.024)	(-0.098 - 0.023)
CY*Jul	-0.022	-0.017	-0.018
	(-0.079 - 0.035)	(-0.082 - 0.047)	(-0.083 - 0.046)
CY*Aug	0.019	0.021	0.021
	(-0.023 - 0.061)	(-0.028 - 0.070)	(-0.028 - 0.070)
CY*Sept	0.082***	0.083**	0.082**
	(0.028 - 0.136)	(0.020 - 0.146)	(0.019 - 0.145)
CY*Oct	0.088***	0.090***	0.090***
	(0.036 - 0.139)	(0.034 - 0.146)	(0.034 - 0.147)
CY*Nov	0.111***	0.113***	0.114***
	(0.057 - 0.166)	(0.052 - 0.173)	(0.052 - 0.175)
CY*Dec	0.068***	0.069**	0.067**
	(0.017 - 0.118)	(0.010 - 0.128)	(0.007 - 0.127)
CZ*Feb	0.009	0.009	0.005
	(-0.048 - 0.067)	(-0.056 - 0.074)	(-0.061 - 0.071)
CZ*Mar	0.040	0.040	0.046
	(-0.014 - 0.094)	(-0.021 - 0.101)	(-0.013 - 0.106)
CZ*Apr	0.065**	0.065**	0.063**
	(0.008 - 0.121)	(0.003 - 0.128)	(0.001 - 0.126)
CZ*May	0.053*	0.055*	0.050
	(-0.003 - 0.109)	(-0.008 - 0.117)	(-0.013 - 0.113)
CZ*Jun	0.061**	0.063*	0.063*
	(0.005 - 0.118)	(-0.000 - 0.126)	(-0.000 - 0.126)
CZ*Jul	0.031	0.032	0.033
	(-0.028 - 0.091)	(-0.038 - 0.102)	(-0.037 - 0.103)
CZ*Aug	0.021	0.021	0.023
	(-0.033 - 0.074)	(-0.041 - 0.084)	(-0.040 - 0.086)
CZ*Sept	-0.018	-0.017	-0.019
	(-0.075 - 0.039)	(-0.083 - 0.049)	(-0.087 - 0.049)
CZ*Oct	-0.027	-0.027	-0.022
	(-0.086 - 0.033)	(-0.096 - 0.041)	(-0.090 - 0.046)
CZ*Nov	-0.004	-0.004	0.008
	(-0.070 - 0.063)	(-0.078 - 0.070)	(-0.063 - 0.078)
CZ*Dec	-0.005	-0.005	0.017
	(-0.068 - 0.057)	(-0.077 - 0.067)	(-0.058 - 0.092)
DK*Feb	0.010	0.010	0.007
	(-0.057 - 0.077)	(-0.061 - 0.080)	(-0.065 - 0.078)

DK*Mar	0.031	0.030	0.037	
	(-0.034 - 0.097)	(-0.039 - 0.099)	(-0.032 - 0.107)	
DK*Apr	0.029	0.028	0.031	
	(-0.037 - 0.095)	(-0.043 - 0.099)	(-0.044 - 0.106)	
DK*May	0.026	0.025	0.032	
	(-0.037 - 0.090)	(-0.043 - 0.093)	(-0.036 - 0.101)	
DK*Jun	0.036	0.035	0.041	
	(-0.027 - 0.099)	(-0.032 - 0.102)	(-0.026 - 0.107)	
DK*Jul	0.017	0.017	0.022	
	(-0.045 - 0.079)	(-0.050 - 0.083)	(-0.046 - 0.091)	
DK*Aug	0.036	0.036	0.046	
	(-0.028 - 0.099)	(-0.033 - 0.104)	(-0.021 - 0.114)	
DK*Sept	-0.018	-0.019	0.002	
	(-0.084 - 0.048)	(-0.092 - 0.053)	(-0.066 - 0.071)	
DK*Oct	0.015	0.015	0.004	
	(-0.051 - 0.080)	(-0.056 - 0.086)	(-0.077 - 0.084)	
DK*Nov	0.033	0.033	0.033	
	(-0.032 - 0.097)	(-0.036 - 0.102)	(-0.039 - 0.106)	
DK*Dec	-0.010	-0.010	-0.013	
	(-0.070 - 0.050)	(-0.074 - 0.055)	(-0.080 - 0.054)	
EST*Feb	0.032			
	(-0.029 - 0.094)			
EST*Mar	0.073**			
	(0.000 - 0.145)			
EST*Apr	0.072**			
	(0.007 - 0.136)			
EST*May	0.067*			
	(-0.000 - 0.134)			
EST*Jun	0.083**			
	(0.020 - 0.146)			
EST*Jul	0.055			
	(-0.013 - 0.123)			
EST*Aug	0.047			
	(-0.018 - 0.111)			
EST*Sept	0.008			
	(-0.053 - 0.069)			
EST*Oct	-0.034			
	(-0.101 - 0.034)			
EST*Nov	0.009			
	(-0.066 - 0.083)			
EST*Dec	0.011			
	(-0.057 - 0.079)			
FI*Feb	-0.001	-0.002	0.005	
	(-0.050 - 0.047)	(-0.048 - 0.045)	(-0.042 - 0.051)	
FI*Mar	0.041*	0.041*	0.040*	
	(-0.005 - 0.088)	(-0.002 - 0.084)	(-0.004 - 0.083)	
FI*Apr	0.039	0.039*	0.037	
	(-0.009 - 0.086)	(-0.007 - 0.085)	(-0.009 - 0.084)	
FI*May	0.008	0.008	0.008	
	(-0.035 - 0.051)	(-0.034 - 0.050)	(-0.035 - 0.051)	
FI*Jun	-0.001	-0.000	-0.002	
	(-0.046 - 0.043)	(-0.043 - 0.042)	(-0.046 - 0.041)	
FI*Jul	-0.029	-0.028	-0.025	
	(-0.075 - 0.018)	(-0.074 - 0.019)	(-0.072 - 0.023)	
FI*Aug	-0.006	-0.005	-0.005	
	(-0.048 - 0.036)	(-0.046 - 0.036)	(-0.048 - 0.038)	
FI*Sept	-0.049**	-0.049**	-0.048**	
	(-0.095 - -0.004)	(-0.094 - -0.003)	(-0.095 - -0.001)	
FI*Oct	-0.028	-0.032	-0.030	
	(-0.072 - 0.016)	(-0.076 - 0.011)	(-0.076 - 0.016)	
FI*Nov	-0.011	-0.011	-0.015	
	(-0.059 - 0.038)	(-0.059 - 0.037)	(-0.066 - 0.036)	
FI*Dec	-0.039	-0.038*	-0.041	
	(-0.086 - 0.009)	(-0.084 - 0.007)	(-0.089 - 0.008)	
FR*Feb	-0.020	-0.020	-0.022	
	(-0.062 - 0.022)	(-0.059 - 0.019)	(-0.060 - 0.016)	
FR*Mar	-0.014	-0.014	-0.017	-0.015
	(-0.053 - 0.026)	(-0.051 - 0.023)	(-0.054 - 0.020)	(-0.058 - 0.027)
FR*Apr	-0.009	-0.009	-0.012	0.075***
	(-0.051 - 0.034)	(-0.050 - 0.033)	(-0.053 - 0.029)	(0.032 - 0.117)
FR*May	-0.007	-0.006	-0.010	0.001

	(-0.048 - 0.035)	(-0.046 - 0.033)	(-0.050 - 0.031)	(-0.043 - 0.044)
FR*Jun	-0.031	-0.030	-0.032	-0.079***
	(-0.071 - 0.010)	(-0.069 - 0.008)	(-0.071 - 0.006)	(-0.123 - -0.035)
FR*Jul	-0.042*	-0.042*	-0.044**	0.009
	(-0.085 - 0.001)	(-0.084 - 0.001)	(-0.088 - -0.001)	(-0.031 - 0.049)
FR*Aug	-0.030	-0.030	-0.032*	0.011
	(-0.068 - 0.007)	(-0.066 - 0.006)	(-0.068 - 0.005)	(-0.026 - 0.049)
FR*Sept	-0.053**	-0.053***	-0.055***	-0.014
	(-0.094 - -0.012)	(-0.094 - -0.013)	(-0.096 - -0.014)	(-0.053 - 0.026)
FR*Oct	0.003	0.004	0.000	
	(-0.037 - 0.044)	(-0.035 - 0.043)	(-0.040 - 0.041)	
FR*Nov	0.035	0.035*	0.034	-0.012
	(-0.008 - 0.078)	(-0.006 - 0.076)	(-0.007 - 0.076)	(-0.049 - 0.025)
FR*Dec	0.038*	0.039**	0.036*	0.027
	(-0.001 - 0.078)	(0.000 - 0.077)	(-0.005 - 0.077)	(-0.017 - 0.071)
GER*Feb	0.001	0.002		0.021
	(-0.066 - 0.069)	(-0.057 - 0.061)		(-0.027 - 0.070)
GER*Mar	0.007	0.008		0.007
	(-0.057 - 0.072)	(-0.050 - 0.066)		(-0.052 - 0.067)
GER*Apr	0.015	0.017		0.101***
	(-0.054 - 0.084)	(-0.050 - 0.083)		(0.034 - 0.169)
GER*May	0.014	0.016		0.025
	(-0.050 - 0.078)	(-0.043 - 0.075)		(-0.036 - 0.086)
GER*Jun	0.032	0.035		-0.012
	(-0.033 - 0.098)	(-0.026 - 0.096)		(-0.076 - 0.052)
GER*Jul	0.032	0.031		0.082***
	(-0.035 - 0.099)	(-0.033 - 0.095)		(0.021 - 0.144)
GER*Aug	0.044	0.043		0.087***
	(-0.020 - 0.107)	(-0.017 - 0.102)		(0.028 - 0.146)
GER*Sept	0.026	0.025		0.066**
	(-0.040 - 0.091)	(-0.037 - 0.087)		(0.005 - 0.127)
GER*Oct	0.007	0.006		0.003
	(-0.059 - 0.072)	(-0.055 - 0.067)		(-0.050 - 0.056)
GER*Nov	0.009	0.009		-0.037
	(-0.058 - 0.076)	(-0.054 - 0.071)		(-0.096 - 0.021)
GER*Dec	0.005	0.005		-0.006
	(-0.060 - 0.070)	(-0.056 - 0.065)		(-0.069 - 0.057)
GR*Feb	-0.059**	-0.059	-0.061*	
	(-0.118 - -0.000)	(-0.132 - 0.014)	(-0.133 - 0.011)	
GR*Mar	-0.057*	-0.057	-0.060*	
	(-0.115 - 0.002)	(-0.128 - 0.014)	(-0.131 - 0.011)	
GR*Apr	-0.087***	-0.087**	-0.090***	
	(-0.141 - -0.033)	(-0.154 - -0.021)	(-0.155 - -0.024)	
GR*May	-0.056*	-0.057	-0.059	
	(-0.113 - 0.001)	(-0.128 - 0.015)	(-0.129 - 0.012)	
GR*Jun	-0.022	-0.023	-0.025	
	(-0.080 - 0.037)	(-0.095 - 0.050)	(-0.096 - 0.047)	
GR*Jul	0.013	0.010	0.008	
	(-0.049 - 0.074)	(-0.066 - 0.087)	(-0.068 - 0.084)	
GR*Aug	-0.033	-0.036	-0.038	
	(-0.086 - 0.021)	(-0.104 - 0.032)	(-0.106 - 0.029)	
GR*Sept	0.000	0.001	-0.001	
	(-0.056 - 0.057)	(-0.069 - 0.070)	(-0.070 - 0.068)	
GR*Oct	0.033	0.033	0.032	
	(-0.022 - 0.087)	(-0.033 - 0.100)	(-0.035 - 0.098)	
GR*Nov	0.031	0.032	0.031	
	(-0.025 - 0.088)	(-0.036 - 0.099)	(-0.036 - 0.099)	
GR*Dec	-0.038	-0.038	-0.041	
	(-0.094 - 0.018)	(-0.107 - 0.031)	(-0.111 - 0.029)	
HU*Feb	-0.035	-0.035	-0.037	
	(-0.087 - 0.017)	(-0.091 - 0.020)	(-0.093 - 0.018)	
HU*Mar	-0.037	-0.037	-0.041	
	(-0.090 - 0.015)	(-0.094 - 0.019)	(-0.098 - 0.017)	
HU*Apr	-0.053*	-0.053	-0.055*	
	(-0.111 - 0.006)	(-0.116 - 0.010)	(-0.119 - 0.009)	
HU*May	-0.076***	-0.076***	-0.078***	
	(-0.128 - -0.024)	(-0.133 - -0.020)	(-0.136 - -0.020)	
HU*Jun	-0.046*	-0.047*	-0.049*	
	(-0.097 - 0.004)	(-0.102 - 0.008)	(-0.105 - 0.007)	
HU*Jul	-0.023	-0.024	-0.026	
	(-0.077 - 0.031)	(-0.083 - 0.035)	(-0.086 - 0.035)	

HU*Aug	-0.030	-0.031	-0.032	
	(-0.080 - 0.021)	(-0.085 - 0.024)	(-0.088 - 0.023)	
HU*Sept	-0.031	-0.031	-0.033	
	(-0.082 - 0.020)	(-0.087 - 0.024)	(-0.090 - 0.024)	
HU*Oct	-0.027	-0.025	-0.026	
	(-0.077 - 0.023)	(-0.078 - 0.028)	(-0.081 - 0.028)	
HU*Nov	-0.013	-0.013	-0.013	
	(-0.065 - 0.039)	(-0.067 - 0.040)	(-0.068 - 0.042)	
HU*Dec	-0.006	-0.008	-0.012	
	(-0.055 - 0.042)	(-0.061 - 0.044)	(-0.067 - 0.043)	
IC*Feb	0.016	0.016	0.007	
	(-0.050 - 0.082)	(-0.043 - 0.075)	(-0.056 - 0.070)	
IC*Mar	-0.011	-0.010	-0.023	
	(-0.080 - 0.058)	(-0.074 - 0.053)	(-0.089 - 0.044)	
IC*Apr	0.026	0.028	0.023	
	(-0.047 - 0.099)	(-0.042 - 0.098)	(-0.052 - 0.098)	
IC*May	0.025	0.027	0.006	
	(-0.045 - 0.095)	(-0.041 - 0.095)	(-0.069 - 0.080)	
IC*Jun	0.015	0.017	0.008	
	(-0.052 - 0.082)	(-0.045 - 0.080)	(-0.064 - 0.079)	
IC*Jul	0.002	0.005	-0.006	
	(-0.066 - 0.070)	(-0.061 - 0.071)	(-0.079 - 0.067)	
IC*Aug	0.028	0.027	0.018	
	(-0.040 - 0.096)	(-0.032 - 0.086)	(-0.048 - 0.084)	
IC*Sept	0.001	0.001	-0.011	
	(-0.075 - 0.078)	(-0.073 - 0.074)	(-0.088 - 0.066)	
IC*Oct	0.016	0.018	0.006	
	(-0.054 - 0.086)	(-0.050 - 0.085)	(-0.069 - 0.081)	
IC*Nov	0.038	0.038	0.041	
	(-0.028 - 0.103)	(-0.023 - 0.099)	(-0.026 - 0.108)	
IC*Dec	-0.005	-0.004	0.003	
	(-0.082 - 0.072)	(-0.076 - 0.067)	(-0.083 - 0.088)	
IR*Feb	-0.049	-0.050	-0.050	
	(-0.147 - 0.049)	(-0.127 - 0.027)	(-0.132 - 0.032)	
IR*Mar	-0.013	-0.015	-0.026	
	(-0.104 - 0.078)	(-0.088 - 0.059)	(-0.104 - 0.052)	
IR*Apr	-0.014	-0.015	-0.020	
	(-0.106 - 0.079)	(-0.090 - 0.060)	(-0.099 - 0.059)	
IR*May	-0.013	-0.015	-0.029	
	(-0.106 - 0.080)	(-0.090 - 0.060)	(-0.111 - 0.053)	
IR*Jun	-0.040	-0.042	-0.057	
	(-0.132 - 0.052)	(-0.118 - 0.034)	(-0.137 - 0.024)	
IR*Jul	-0.055	-0.055	-0.063	
	(-0.149 - 0.039)	(-0.130 - 0.020)	(-0.143 - 0.018)	
IR*Aug	-0.049	-0.050	-0.065	
	(-0.141 - 0.042)	(-0.123 - 0.023)	(-0.143 - 0.013)	
IR*Sept	-0.061	-0.062	-0.080*	
	(-0.155 - 0.033)	(-0.141 - 0.017)	(-0.163 - 0.004)	
IR*Oct	-0.029	-0.027	-0.023	
	(-0.127 - 0.068)	(-0.105 - 0.050)	(-0.103 - 0.058)	
IR*Nov	0.001	0.003	0.010	
	(-0.098 - 0.101)	(-0.076 - 0.082)	(-0.072 - 0.092)	
IR*Dec	-0.033	-0.032	-0.041	
	(-0.144 - 0.078)	(-0.131 - 0.067)	(-0.148 - 0.066)	
IT*Feb	-0.039	-0.040	-0.041*	-0.020
	(-0.086 - 0.008)	(-0.089 - 0.010)	(-0.089 - 0.007)	(-0.056 - 0.016)
IT*Mar	-0.034	-0.035	-0.037	-0.036
	(-0.083 - 0.015)	(-0.085 - 0.016)	(-0.087 - 0.012)	(-0.088 - 0.015)
IT*Apr	-0.085***	-0.085***	-0.086***	
	(-0.137 - -0.032)	(-0.140 - -0.029)	(-0.140 - -0.032)	
IT*Ma	-0.028	-0.028	-0.030	-0.020
	(-0.083 - 0.027)	(-0.087 - 0.030)	(-0.087 - 0.028)	(-0.078 - 0.038)
IT*Jun	-0.075***	-0.075***	-0.077***	-0.124***
	(-0.122 - -0.028)	(-0.125 - -0.026)	(-0.125 - -0.029)	(-0.174 - -0.073)
IT*Jul	-0.052*	-0.051*	-0.052*	
	(-0.104 - 0.000)	(-0.105 - 0.004)	(-0.106 - 0.002)	
IT*Aug	-0.022	-0.022	-0.023	0.021
	(-0.069 - 0.024)	(-0.068 - 0.025)	(-0.069 - 0.023)	(-0.023 - 0.066)
IT*Sept	0.006	0.006	0.005	0.046*
	(-0.047 - 0.059)	(-0.048 - 0.061)	(-0.048 - 0.059)	(-0.005 - 0.097)
IT*Oct	0.042*	0.042	0.041	0.038*

	(-0.007 - 0.090)	(-0.011 - 0.095)	(-0.012 - 0.093)	(-0.004 - 0.080)
IT*Nov	0.035	0.035	0.035	-0.012
	(-0.017 - 0.087)	(-0.019 - 0.089)	(-0.019 - 0.089)	(-0.061 - 0.037)
IT*Dec	0.014	0.014	0.011	0.002
	(-0.037 - 0.064)	(-0.038 - 0.066)	(-0.042 - 0.064)	(-0.053 - 0.056)
LV*Feb	-0.024	-0.024	-0.015	
	(-0.095 - 0.047)	(-0.106 - 0.059)	(-0.100 - 0.069)	
LV*Mar	0.061*	0.061	0.068*	
	(-0.005 - 0.128)	(-0.017 - 0.139)	(-0.010 - 0.147)	
LV*Apr	0.028	0.028	0.037	
	(-0.046 - 0.102)	(-0.057 - 0.114)	(-0.050 - 0.123)	
LV*Ma	0.028	0.028	0.038	
	(-0.045 - 0.100)	(-0.057 - 0.114)	(-0.048 - 0.123)	
LV*Jun	0.028	0.029	0.038	
	(-0.040 - 0.096)	(-0.049 - 0.108)	(-0.040 - 0.117)	
LV*Jul	0.020	0.022	0.031	
	(-0.056 - 0.097)	(-0.065 - 0.108)	(-0.057 - 0.118)	
LV*Aug	0.000	0.002	0.010	
	(-0.072 - 0.073)	(-0.082 - 0.086)	(-0.075 - 0.095)	
LV*Sept	-0.037	-0.035	-0.026	
	(-0.117 - 0.043)	(-0.127 - 0.056)	(-0.118 - 0.066)	
LV*Oct	-0.054	-0.038	-0.029	
	(-0.129 - 0.020)	(-0.127 - 0.051)	(-0.119 - 0.061)	
LV*Nov	-0.036	-0.037	-0.027	
	(-0.108 - 0.036)	(-0.120 - 0.045)	(-0.110 - 0.056)	
LV*Dec	-0.037	-0.038	-0.037	
	(-0.105 - 0.030)	(-0.117 - 0.042)	(-0.119 - 0.045)	
LIT*Feb	-0.030	-0.030	-0.030	
	(-0.125 - 0.066)	(-0.111 - 0.052)	(-0.113 - 0.052)	
LIT*Mar	0.002	0.002	-0.001	
	(-0.087 - 0.091)	(-0.073 - 0.076)	(-0.078 - 0.077)	
LIT*Apr	0.030	0.029	0.030	
	(-0.065 - 0.125)	(-0.058 - 0.116)	(-0.058 - 0.118)	
LIT*May	0.019	0.018	0.020	
	(-0.078 - 0.115)	(-0.070 - 0.106)	(-0.069 - 0.109)	
LIT*Jun	0.019	0.019	0.021	
	(-0.077 - 0.115)	(-0.065 - 0.102)	(-0.064 - 0.105)	
LIT*Jul	0.041	0.041	0.042	
	(-0.067 - 0.148)	(-0.058 - 0.139)	(-0.058 - 0.142)	
LIT*Aug	0.016	0.017	0.018	
	(-0.080 - 0.113)	(-0.070 - 0.104)	(-0.070 - 0.107)	
LIT*Sept	-0.033	-0.032	-0.031	
	(-0.131 - 0.065)	(-0.124 - 0.059)	(-0.123 - 0.062)	
LIT*Oct	-0.062	-0.043	-0.041	
	(-0.153 - 0.030)	(-0.132 - 0.046)	(-0.132 - 0.050)	
LIT*Nov	-0.022	-0.013	-0.011	
	(-0.110 - 0.067)	(-0.094 - 0.069)	(-0.093 - 0.072)	
LIT*Dec	-0.040	-0.030	-0.032	
	(-0.129 - 0.049)	(-0.112 - 0.052)	(-0.117 - 0.053)	
LUX*Feb	-0.035	-0.035	-0.042	
	(-0.099 - 0.030)	(-0.098 - 0.027)	(-0.123 - 0.040)	
LUX*Mar	-0.021	-0.022	-0.033	
	(-0.083 - 0.041)	(-0.081 - 0.037)	(-0.104 - 0.038)	
LUX*Apr	-0.040	-0.040	-0.054*	
	(-0.105 - 0.026)	(-0.103 - 0.023)	(-0.117 - 0.009)	
LUX*Ma	-0.009	-0.010	-0.029	
	(-0.071 - 0.054)	(-0.070 - 0.051)	(-0.101 - 0.043)	
LUX*Jun	-0.049	-0.051	-0.061	
	(-0.113 - 0.014)	(-0.113 - 0.010)	(-0.134 - 0.012)	
LUX*Jul	-0.006	-0.008	-0.004	
	(-0.065 - 0.053)	(-0.066 - 0.051)	(-0.075 - 0.066)	
LUX*Aug	-0.074**	-0.077***	-0.079**	
	(-0.131 - -0.018)	(-0.134 - -0.021)	(-0.141 - -0.017)	
LUX*Sept	-0.096***	-0.099***	-0.113***	
	(-0.153 - -0.040)	(-0.154 - -0.044)	(-0.174 - -0.053)	
LUX*Oct	-0.051*	-0.049*	-0.057*	
	(-0.108 - 0.007)	(-0.105 - 0.007)	(-0.126 - 0.011)	
LUX*Nov	-0.007	-0.006	-0.007	
	(-0.061 - 0.048)	(-0.059 - 0.047)	(-0.068 - 0.053)	
LUX*Dec	-0.024	-0.024	-0.024	
	(-0.077 - 0.029)	(-0.076 - 0.028)	(-0.087 - 0.038)	

MA*Feb	-0.073	-0.073	-0.075	
	(-0.169 - 0.022)	(-0.168 - 0.022)	(-0.170 - 0.020)	
MA*Mar	-0.052	-0.051	-0.054	
	(-0.162 - 0.057)	(-0.161 - 0.059)	(-0.165 - 0.056)	
MA*Apr	-0.146***	-0.145***	-0.147***	
	(-0.243 - -0.050)	(-0.242 - -0.048)	(-0.244 - -0.050)	
MA*May	-0.137***	-0.135***	-0.136***	
	(-0.239 - -0.035)	(-0.237 - -0.033)	(-0.238 - -0.033)	
MA*Jun	-0.141***	-0.139***	-0.140***	
	(-0.237 - -0.045)	(-0.235 - -0.043)	(-0.236 - -0.044)	
MA*Jul	-0.151***	-0.149***	-0.151***	
	(-0.254 - -0.048)	(-0.255 - -0.044)	(-0.256 - -0.045)	
MA*Aug	-0.097**	-0.095*	-0.096**	
	(-0.190 - -0.003)	(-0.190 - 0.001)	(-0.191 - -0.001)	
MA*Sept	-0.061	-0.059	-0.060	
	(-0.156 - 0.033)	(-0.154 - 0.037)	(-0.155 - 0.036)	
MA*Oct	0.002	0.003	0.003	
	(-0.097 - 0.101)	(-0.095 - 0.101)	(-0.096 - 0.102)	
MA*Nov	0.026	0.024	0.025	
	(-0.075 - 0.127)	(-0.077 - 0.126)	(-0.076 - 0.126)	
MA*Dec	-0.027	-0.025	-0.027	
	(-0.183 - 0.130)	(-0.171 - 0.122)	(-0.175 - 0.121)	
NETH*Feb	-0.005	-0.006	-0.006	0.013
	(-0.058 - 0.048)	(-0.054 - 0.042)	(-0.056 - 0.044)	(-0.019 - 0.044)
NETH*Mar	0.007	0.007	0.002	0.008
	(-0.043 - 0.057)	(-0.038 - 0.051)	(-0.043 - 0.048)	(-0.037 - 0.052)
NETH*Apr	0.012	0.011	0.013	0.093***
	(-0.039 - 0.064)	(-0.037 - 0.059)	(-0.035 - 0.062)	(0.047 - 0.139)
NETH*May	-0.004	-0.005	-0.006	0.006
	(-0.051 - 0.043)	(-0.048 - 0.038)	(-0.048 - 0.037)	(-0.035 - 0.048)
NETH*Jun	-0.008	-0.010	-0.010	-0.052**
	(-0.058 - 0.042)	(-0.057 - 0.037)	(-0.056 - 0.037)	(-0.100 - -0.004)
NETH*Jul	-0.022	-0.024	-0.024	0.027
	(-0.073 - 0.029)	(-0.073 - 0.026)	(-0.074 - 0.025)	(-0.015 - 0.069)
NETH*Aug	0.004	0.001	0.001	0.046**
	(-0.041 - 0.048)	(-0.041 - 0.043)	(-0.041 - 0.042)	(0.009 - 0.083)
NETH*Sept	-0.020	-0.024	-0.025	0.021
	(-0.068 - 0.028)	(-0.070 - 0.022)	(-0.071 - 0.022)	(-0.020 - 0.062)
NETH*Oct	0.005	0.006	0.001	-0.003
	(-0.046 - 0.056)	(-0.042 - 0.053)	(-0.047 - 0.048)	(-0.033 - 0.026)
NETH*Nov	0.028	0.029	0.025	-0.023
	(-0.025 - 0.081)	(-0.020 - 0.078)	(-0.024 - 0.075)	(-0.063 - 0.018)
NETH*Dec	0.002	0.002	-0.001	-0.007
	(-0.049 - 0.053)	(-0.046 - 0.051)	(-0.052 - 0.050)	(-0.055 - 0.041)
NO*Feb	-0.078	-0.080	-0.082	
	(-0.253 - 0.097)	(-0.253 - 0.094)	(-0.256 - 0.093)	
NO*Mar	-0.048	-0.050	-0.053	
	(-0.223 - 0.126)	(-0.223 - 0.123)	(-0.228 - 0.121)	
NO*Apr	0.075	0.075	0.072	
	(-0.169 - 0.319)	(-0.170 - 0.320)	(-0.174 - 0.318)	
NO*Ma	-0.026	-0.026	-0.028	
	(-0.198 - 0.146)	(-0.198 - 0.146)	(-0.200 - 0.145)	
NO*Jun	-0.039	-0.039	-0.041	
	(-0.212 - 0.134)	(-0.211 - 0.133)	(-0.214 - 0.133)	
NO*Jul	0.016	0.017	0.016	
	(-0.229 - 0.261)	(-0.229 - 0.264)	(-0.232 - 0.263)	
NO*Aug	-0.075	-0.076	-0.078	
	(-0.247 - 0.097)	(-0.248 - 0.096)	(-0.250 - 0.095)	
NO*Sept	-0.138	-0.138	-0.139	
	(-0.312 - 0.037)	(-0.312 - 0.036)	(-0.314 - 0.036)	
NO*Oct	-0.033	-0.032	-0.033	
	(-0.281 - 0.214)	(-0.280 - 0.216)	(-0.283 - 0.217)	
NO*Nov	-0.125	-0.123	-0.124	
	(-0.299 - 0.050)	(-0.297 - 0.051)	(-0.299 - 0.051)	
NO*Dec	-0.165*	-0.164*	-0.168*	
	(-0.339 - 0.009)	(-0.338 - 0.009)	(-0.343 - 0.007)	
POL*Feb	-0.051**	-0.051*	-0.053*	
	(-0.101 - -0.001)	(-0.110 - 0.009)	(-0.111 - 0.005)	
POL*Mar	-0.009	-0.009	-0.012	
	(-0.062 - 0.044)	(-0.069 - 0.051)	(-0.071 - 0.047)	
POL*Apr	-0.004	-0.002	-0.004	

	(-0.057 - 0.050)	(-0.064 - 0.060)	(-0.065 - 0.057)
POL*May	-0.029	-0.027	-0.028
	(-0.079 - 0.020)	(-0.085 - 0.031)	(-0.086 - 0.029)
POL*Jun	-0.029	-0.027	-0.028
	(-0.078 - 0.019)	(-0.084 - 0.031)	(-0.084 - 0.028)
POL*Jul	-0.026	-0.022	-0.024
	(-0.075 - 0.023)	(-0.083 - 0.039)	(-0.084 - 0.036)
POL*Aug	-0.050**	-0.047	-0.048*
	(-0.096 - -0.005)	(-0.103 - 0.009)	(-0.103 - 0.007)
POL*Sept	-0.048*	-0.043	-0.045
	(-0.097 - 0.001)	(-0.105 - 0.018)	(-0.105 - 0.015)
POL*Oct	-0.082***	-0.084***	-0.085***
	(-0.130 - -0.034)	(-0.144 - -0.023)	(-0.144 - -0.025)
POL*Nov	-0.086***	-0.087***	-0.086***
	(-0.137 - -0.034)	(-0.150 - -0.023)	(-0.149 - -0.023)
POL*Dec	-0.104***	-0.104***	-0.107***
	(-0.159 - -0.049)	(-0.173 - -0.035)	(-0.176 - -0.038)
POR*Feb	-0.036	-0.037	-0.038
	(-0.109 - 0.037)	(-0.115 - 0.042)	(-0.113 - 0.037)
POR*Mar	-0.005	-0.006	-0.007
	(-0.076 - 0.066)	(-0.083 - 0.071)	(-0.081 - 0.066)
POR*Apr	-0.009	-0.010	-0.010
	(-0.080 - 0.062)	(-0.087 - 0.067)	(-0.083 - 0.064)
POR*May	0.005	0.004	0.005
	(-0.058 - 0.069)	(-0.065 - 0.074)	(-0.061 - 0.071)
POR*Jun	-0.041	-0.042	-0.042
	(-0.112 - 0.030)	(-0.119 - 0.034)	(-0.115 - 0.031)
POR*Jul	-0.050	-0.052	-0.052
	(-0.121 - 0.021)	(-0.129 - 0.025)	(-0.126 - 0.023)
POR*Aug	-0.019	-0.022	-0.022
	(-0.088 - 0.050)	(-0.098 - 0.055)	(-0.094 - 0.051)
POR*Sept	0.019	0.017	0.017
	(-0.056 - 0.094)	(-0.065 - 0.099)	(-0.062 - 0.096)
POR*Oct	0.031	0.033	0.029
	(-0.041 - 0.103)	(-0.046 - 0.112)	(-0.050 - 0.108)
POR*Nov	0.064*	0.066*	0.066*
	(-0.006 - 0.135)	(-0.011 - 0.143)	(-0.008 - 0.140)
POR*Dec	0.036	0.037	0.029
	(-0.034 - 0.107)	(-0.040 - 0.115)	(-0.048 - 0.106)
RO*Feb	-0.039	-0.043	-0.045
	(-0.105 - 0.027)	(-0.114 - 0.029)	(-0.117 - 0.028)
RO*Mar	-0.028	-0.037	-0.041
	(-0.095 - 0.038)	(-0.110 - 0.035)	(-0.114 - 0.033)
RO*Apr	-0.038	-0.051	-0.054
	(-0.104 - 0.027)	(-0.122 - 0.019)	(-0.125 - 0.017)
RO*Ma	-0.038	-0.045	-0.047
	(-0.104 - 0.027)	(-0.118 - 0.027)	(-0.120 - 0.027)
RO*Jun	-0.006	-0.009	-0.011
	(-0.067 - 0.055)	(-0.076 - 0.059)	(-0.079 - 0.058)
RO*Jul	0.025	0.023	0.021
	(-0.037 - 0.088)	(-0.046 - 0.093)	(-0.049 - 0.092)
RO*Aug	-0.006	-0.007	-0.009
	(-0.070 - 0.057)	(-0.079 - 0.065)	(-0.082 - 0.064)
RO*Sept	-0.025	-0.025	-0.027
	(-0.110 - 0.060)	(-0.124 - 0.074)	(-0.127 - 0.073)
RO*Oct	-0.002	0.006	0.005
	(-0.058 - 0.054)	(-0.056 - 0.069)	(-0.059 - 0.069)
RO*Nov	0.010	0.011	0.011
	(-0.047 - 0.068)	(-0.051 - 0.074)	(-0.053 - 0.075)
RO*Dec	-0.018	-0.013	-0.016
	(-0.073 - 0.038)	(-0.076 - 0.050)	(-0.081 - 0.048)
SK*Feb	-0.019	-0.019	-0.020
	(-0.090 - 0.052)	(-0.090 - 0.053)	(-0.092 - 0.051)
SK*Mar	-0.004	-0.004	-0.007
	(-0.077 - 0.068)	(-0.078 - 0.070)	(-0.082 - 0.068)
SK*Apr	0.004	0.005	0.003
	(-0.063 - 0.071)	(-0.064 - 0.075)	(-0.066 - 0.073)
SK*Ma	-0.014	-0.012	-0.014
	(-0.080 - 0.052)	(-0.081 - 0.057)	(-0.083 - 0.056)
SK*Jun	-0.019	-0.017	-0.018
	(-0.085 - 0.047)	(-0.085 - 0.051)	(-0.086 - 0.051)

SK*Jul	-0.028 (-0.094 - 0.037)	-0.026 (-0.098 - 0.045)	-0.028 (-0.100 - 0.044)	
SK*Aug	-0.034 (-0.095 - 0.026)	-0.032 (-0.097 - 0.033)	-0.032 (-0.098 - 0.033)	
SK*Sept	-0.025 (-0.089 - 0.040)	-0.022 (-0.092 - 0.048)	-0.023 (-0.093 - 0.048)	
SK*Oct	-0.092*** (-0.155 - -0.028)	-0.092** (-0.162 - -0.022)	-0.092** (-0.162 - -0.021)	
SK*Nov	-0.088** (-0.156 - -0.020)	-0.088** (-0.161 - -0.015)	-0.087** (-0.160 - -0.014)	
SK*Dec	-0.073** (-0.145 - -0.000)	-0.072* (-0.152 - 0.007)	-0.066 (-0.148 - 0.016)	
SL*Feb	-0.058 (-0.150 - 0.033)	-0.058 (-0.152 - 0.035)	-0.067 (-0.162 - 0.029)	
SL*Mar	-0.013 (-0.101 - 0.074)	-0.014 (-0.104 - 0.076)	-0.028 (-0.120 - 0.065)	
SL*Apr	-0.006 (-0.102 - 0.090)	-0.006 (-0.104 - 0.092)	-0.009 (-0.109 - 0.090)	
SL*Ma	0.014 (-0.075 - 0.102)	0.014 (-0.077 - 0.105)	0.000 (-0.091 - 0.091)	
SL*Jun	-0.014 (-0.099 - 0.072)	-0.013 (-0.102 - 0.075)	-0.026 (-0.114 - 0.062)	
SL*Jul	-0.017 (-0.114 - 0.080)	-0.017 (-0.117 - 0.084)	-0.030 (-0.131 - 0.070)	
SL*Aug	-0.012 (-0.109 - 0.085)	-0.012 (-0.112 - 0.088)	-0.026 (-0.126 - 0.074)	
SL*Sept	-0.023 (-0.117 - 0.071)	-0.023 (-0.121 - 0.074)	-0.037 (-0.135 - 0.061)	
SL*Oct	-0.019 (-0.116 - 0.078)	-0.019 (-0.120 - 0.081)	-0.032 (-0.132 - 0.068)	
SL*Nov	-0.024 (-0.123 - 0.074)	-0.025 (-0.126 - 0.076)	-0.037 (-0.137 - 0.064)	
SL*Dec	-0.042 (-0.132 - 0.049)	-0.042 (-0.137 - 0.053)	-0.057 (-0.153 - 0.039)	
SP*Feb	-0.026 (-0.070 - 0.019)	-0.026 (-0.078 - 0.026)	-0.028 (-0.076 - 0.020)	-0.007 (-0.045 - 0.031)
SP*Mar	0.003 (-0.039 - 0.045)	0.002 (-0.049 - 0.052)	-0.001 (-0.048 - 0.046)	-0.000 (-0.050 - 0.049)
SP*Apr	0.004 (-0.041 - 0.049)	0.003 (-0.051 - 0.058)	0.000 (-0.051 - 0.051)	0.087*** (0.036 - 0.138)
SP*Ma	-0.006 (-0.049 - 0.036)	-0.008 (-0.061 - 0.046)	-0.014 (-0.065 - 0.037)	
SP*Jun	-0.046** (-0.089 - -0.003)	-0.048* (-0.101 - 0.006)	-0.050** (-0.100 - -0.001)	-0.096*** (-0.150 - -0.043)
SP*Jul	-0.064*** (-0.110 - -0.018)	-0.063** (-0.119 - -0.007)	-0.065** (-0.118 - -0.012)	-0.014 (-0.063 - 0.036)
SP*Aug	-0.042** (-0.082 - -0.001)	-0.041* (-0.090 - 0.008)	-0.043* (-0.089 - 0.003)	
SP*Sept	-0.037* (-0.081 - 0.007)	-0.037 (-0.091 - 0.017)	-0.038 (-0.090 - 0.013)	0.001 (-0.049 - 0.052)
SP*Oct	0.015 (-0.027 - 0.058)	0.017 (-0.035 - 0.068)	0.014 (-0.035 - 0.063)	0.011 (-0.027 - 0.049)
SP*Nov	0.048** (0.002 - 0.094)	0.048* (-0.004 - 0.101)	0.047* (-0.003 - 0.098)	
SP*Dec	0.030 (-0.017 - 0.078)	0.031 (-0.024 - 0.086)	0.028 (-0.027 - 0.082)	0.019 (-0.037 - 0.074)
SE*Feb	0.029 (-0.019 - 0.077)	0.027 (-0.017 - 0.072)	0.028 (-0.019 - 0.075)	
SE*Mar	0.080*** (0.035 - 0.124)	0.078*** (0.037 - 0.118)	0.077*** (0.034 - 0.120)	
SE*Apr	0.110*** (0.065 - 0.154)	0.109*** (0.066 - 0.151)	0.103*** (0.057 - 0.149)	
SE*Ma	0.074*** (0.032 - 0.117)	0.073*** (0.034 - 0.113)	0.072*** (0.030 - 0.115)	
SE*Jun	0.046** (0.002 - 0.090)	0.046** (0.004 - 0.088)	0.049** (0.003 - 0.095)	
SE*Jul	0.014 (-0.032 - 0.060)	0.014 (-0.032 - 0.059)	0.012 (-0.036 - 0.059)	
SE*Aug	0.012 (-0.030 - 0.053)	0.010 (-0.030 - 0.049)	0.006 (-0.035 - 0.046)	
SE*Sept	-0.060***	-0.061***	-0.064***	

	(-0.104 - -0.015)	(-0.104 - -0.018)	(-0.109 - -0.019)	
SE*Oct	-0.045**	-0.045**	-0.050**	
	(-0.089 - -0.000)	(-0.087 - -0.002)	(-0.094 - -0.005)	
SE*Nov	-0.067***	-0.067***	-0.071***	
	(-0.114 - -0.020)	(-0.112 - -0.023)	(-0.118 - -0.025)	
SE*Dec	-0.103***	-0.103***	-0.105***	
	(-0.146 - -0.059)	(-0.145 - -0.061)	(-0.149 - -0.060)	
SW*Feb	-0.013	-0.010		
	(-0.058 - 0.031)	(-0.054 - 0.035)		
SW*Mar	-0.006	-0.001		
	(-0.047 - 0.035)	(-0.042 - 0.041)		
SW*Apr	0.017	0.019		
	(-0.026 - 0.061)	(-0.026 - 0.064)		
SW*Ma	0.015	0.016		
	(-0.026 - 0.057)	(-0.026 - 0.057)		
SW*Jun	0.004	0.005		
	(-0.038 - 0.047)	(-0.038 - 0.047)		
SW*Jul	-0.016	-0.013		
	(-0.064 - 0.031)	(-0.063 - 0.036)		
SW*Aug	-0.013	-0.012		
	(-0.054 - 0.028)	(-0.054 - 0.030)		
SW*Sept	-0.017	-0.019		
	(-0.061 - 0.028)	(-0.064 - 0.027)		
SW*Oct	-0.008	-0.014		
	(-0.054 - 0.038)	(-0.061 - 0.033)		
SW*Nov	0.019	0.013		
	(-0.028 - 0.066)	(-0.033 - 0.059)		
SW*Dec	0.017	0.014		
	(-0.025 - 0.059)	(-0.029 - 0.057)		
UK*Feb	-0.020	-0.021	-0.023	-0.001
	(-0.078 - 0.037)	(-0.071 - 0.029)	(-0.070 - 0.025)	(-0.046 - 0.043)
UK*Mar	0.002	0.001	-0.002	
	(-0.052 - 0.055)	(-0.046 - 0.048)	(-0.046 - 0.043)	
UK*Apr	0.003	0.003	0.001	0.086***
	(-0.052 - 0.059)	(-0.047 - 0.053)	(-0.047 - 0.049)	(0.033 - 0.139)
UK*May	-0.003	-0.004	-0.005	0.005
	(-0.059 - 0.052)	(-0.053 - 0.046)	(-0.052 - 0.042)	(-0.049 - 0.060)
UK*Jun	-0.018	-0.019	-0.020	-0.067**
	(-0.073 - 0.036)	(-0.067 - 0.029)	(-0.067 - 0.027)	(-0.122 - -0.013)
UK*Jul	-0.049*	-0.050*	-0.051**	0.001
	(-0.106 - 0.008)	(-0.102 - 0.001)	(-0.101 - -0.001)	(-0.051 - 0.052)
UK*Aug	-0.030	-0.031	-0.032	0.012
	(-0.082 - 0.022)	(-0.077 - 0.015)	(-0.077 - 0.012)	(-0.037 - 0.061)
UK*Sept	-0.039	-0.040	-0.042*	
	(-0.093 - 0.015)	(-0.089 - 0.009)	(-0.089 - 0.006)	
UK*Oct	0.004	0.004	0.003	0.000
	(-0.052 - 0.060)	(-0.045 - 0.054)	(-0.045 - 0.052)	(-0.045 - 0.045)
UK*Nov	0.034	0.034	0.036	-0.013
	(-0.026 - 0.094)	(-0.019 - 0.087)	(-0.016 - 0.087)	(-0.066 - 0.040)
UK*Dec	0.012	0.012	0.007	
	(-0.044 - 0.068)	(-0.038 - 0.063)	(-0.043 - 0.058)	
US*Feb	0.097***	0.097***	0.093**	0.117***
	(0.046 - 0.149)	(0.035 - 0.159)	(0.012 - 0.174)	(0.070 - 0.163)
US*Mar	0.036	0.035	0.023	0.034
	(-0.016 - 0.088)	(-0.026 - 0.096)	(-0.055 - 0.101)	(-0.023 - 0.091)
US*May	0.055**	0.053*	0.040	0.138***
	(0.002 - 0.107)	(-0.008 - 0.115)	(-0.036 - 0.117)	(0.083 - 0.194)
US*Jun	0.016	0.015	0.009	0.025
	(-0.033 - 0.064)	(-0.044 - 0.074)	(-0.064 - 0.081)	(-0.030 - 0.079)
US*Jul	0.048*	0.047	0.039	
	(-0.004 - 0.099)	(-0.014 - 0.107)	(-0.034 - 0.113)	
US*Aug	-0.017	-0.018	-0.028	0.034
	(-0.069 - 0.035)	(-0.081 - 0.045)	(-0.103 - 0.048)	(-0.019 - 0.088)
US*Sept	0.027	0.025	0.022	0.069***
	(-0.021 - 0.074)	(-0.032 - 0.082)	(-0.051 - 0.096)	(0.019 - 0.120)
US*Oct	0.023	0.022	0.004	0.064**
	(-0.029 - 0.076)	(-0.040 - 0.083)	(-0.076 - 0.084)	(0.010 - 0.118)
US*Nov	0.015	0.015	0.001	0.014
	(-0.033 - 0.064)	(-0.043 - 0.072)	(-0.076 - 0.078)	(-0.028 - 0.057)
US*Dec	0.079***	0.079***	0.079*	0.034
UK*Feb	(0.027 - 0.132)	(0.020 - 0.139)	(-0.001 - 0.159)	(-0.016 - 0.084)

	0.057**	0.057*	0.038	0.046*
	(0.008 - 0.105)	(-0.001 - 0.114)	(-0.038 - 0.113)	(-0.009 - 0.102)
Constant	-10.400***	-4.594***	-7.221***	-1.168
	(-12.039 - -8.761)	(-6.286 - -2.902)	(-9.612 - -4.831)	(-3.504 - 1.168)
N	4,181	4,004	3,503	898
R-squared	0.857	0.841	0.830	0.945

Source: elaboration of the author based on data from Eurostat, ECB, Bank of England, OECD and Federal Reserve Economic Data (St. Louis FED), US National Vital Statistics and US Treasury. EPU index by Beker et al. (2012).
Note: Robust CI in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A1.3: Elasticity of monthly fertility rates to macroeconomic indicators. EPU sample.

	Model (1)	Model (2)	Model (3)
Unemployment rate	-0.085***	-0.069***	-0.062***
	(-0.096 - -0.074)	(-0.083 - -0.054)	(-0.076 - -0.048)
EPU index	0.005	0.005	0.006*
	(-0.002 - 0.012)	(-0.003 - 0.013)	(-0.001 - 0.014)
10y Govt. Bond Yields		-0.012**	
		(-0.024 - -0.001)	
Spread in Bond Yields			-0.011***
			(-0.014 - -0.009)
Year	0.004***	0.004***	0.008***
	(0.003 - 0.005)	(0.003 - 0.006)	(0.006 - 0.009)
Feb	-0.092***	-0.098***	-0.097***
	(-0.108 - -0.076)	(-0.119 - -0.077)	(-0.119 - -0.076)
Mar	-0.007	-0.005	-0.003
	(-0.051 - 0.037)	(-0.027 - 0.016)	(-0.033 - 0.028)
Apr	0.012	-0.029**	-0.022
	(-0.017 - 0.042)	(-0.057 - -0.001)	(-0.051 - 0.008)
Ma	0.005	0.007	0.003
	(-0.015 - 0.025)	(-0.036 - 0.049)	(-0.020 - 0.026)
Jun	-0.017**	0.001	-0.018**
	(-0.032 - -0.002)	(-0.028 - 0.030)	(-0.032 - -0.004)
Jul	0.041*	0.048***	0.028**
	(-0.004 - 0.085)	(0.035 - 0.060)	(0.006 - 0.049)
Aug	0.032	0.033***	0.034**
	(-0.011 - 0.075)	(0.020 - 0.046)	(0.003 - 0.065)
Sept	0.037***	0.037***	0.036**
	(0.018 - 0.056)	(0.016 - 0.057)	(0.005 - 0.067)
Oct	0.048***	0.029**	0.025*
	(0.027 - 0.069)	(0.001 - 0.057)	(-0.002 - 0.052)
Nov	-0.018	-0.029*	-0.032**
	(-0.067 - 0.031)	(-0.059 - 0.000)	(-0.061 - -0.003)
Dec	-0.014	-0.016	-0.027
	(-0.048 - 0.019)	(-0.060 - 0.028)	(-0.060 - 0.006)
FR	0.205***	0.196***	0.197***
	(0.184 - 0.226)	(0.174 - 0.218)	(0.174 - 0.221)
GER	-0.237***		
	(-0.290 - -0.184)		
IT	-0.097***	-0.102***	-0.089***
	(-0.123 - -0.071)	(-0.130 - -0.074)	(-0.117 - -0.061)
SP	-0.048***	-0.062***	-0.061***
	(-0.071 - -0.026)	(-0.089 - -0.036)	(-0.088 - -0.034)
UK	0.107***	0.105***	0.117***
	(0.067 - 0.148)	(0.066 - 0.143)	(0.084 - 0.150)
US	0.145***		
	(0.119 - 0.172)		
FR*Feb		0.006	0.005
		(-0.020 - 0.031)	(-0.020 - 0.030)
FR*Mar	-0.015	-0.017	-0.019
	(-0.063 - 0.032)	(-0.043 - 0.010)	(-0.053 - 0.015)
FR*Apr	-0.063***	-0.021	-0.031*
	(-0.096 - -0.029)	(-0.053 - 0.010)	(-0.064 - 0.003)
FR*May	-0.000	-0.003	-0.001
	(-0.029 - 0.029)	(-0.049 - 0.044)	(-0.031 - 0.029)
FR*Jul	0.007		0.020
	(-0.040 - 0.054)		(-0.006 - 0.046)
FR*Aug	0.001		0.001
	(-0.045 - 0.046)		(-0.033 - 0.034)
FR*Sept	-0.016	-0.017	-0.014
	(-0.040 - 0.008)	(-0.041 - 0.007)	(-0.048 - 0.020)

FR*Oct	-0.013 (-0.041 - 0.015)	0.006 (-0.027 - 0.038)	0.009 (-0.023 - 0.040)
FR*Nov	0.001 (-0.051 - 0.053)	0.012 (-0.020 - 0.045)	0.016 (-0.016 - 0.048)
FR*Dec	0.025 (-0.012 - 0.061)	0.026 (-0.019 - 0.072)	0.041** (0.006 - 0.076)
FR*Jun		-0.019 (-0.050 - 0.012)	
GER*Feb	0.021 (-0.032 - 0.074)		
GER*Mar	0.005 (-0.061 - 0.072)		
GER*Apr	-0.040 (-0.101 - 0.022)		
GER*Ma	0.019 (-0.034 - 0.073)		
GER*Jun	0.062** (0.010 - 0.115)		
GER*Jul	0.081** (0.014 - 0.147)		
GER*Aug	0.074** (0.008 - 0.139)		
GER*Sept	0.062** (0.008 - 0.115)		
GER*Oct	-0.010 (-0.065 - 0.045)		
GER*Nov	-0.025 (-0.096 - 0.045)		
GER*Dec	-0.009 (-0.070 - 0.051)		
IT*Feb	-0.019 (-0.049 - 0.011)	-0.014 (-0.047 - 0.020)	-0.013 (-0.046 - 0.020)
IT*Mar	-0.036 (-0.089 - 0.018)	-0.037* (-0.075 - 0.001)	-0.038* (-0.082 - 0.005)
IT*Apr	-0.139*** (-0.184 - -0.094)	-0.098*** (-0.142 - -0.053)	-0.104*** (-0.149 - -0.059)
IT*Ma	-0.023 (-0.067 - 0.022)	-0.025 (-0.083 - 0.034)	-0.020 (-0.066 - 0.026)
IT*Jun	-0.045*** (-0.073 - -0.016)	-0.063*** (-0.102 - -0.025)	-0.043*** (-0.072 - -0.014)
IT*Jul	-0.003 (-0.057 - 0.052)	-0.009 (-0.044 - 0.025)	0.013 (-0.025 - 0.051)
IT*Aug	0.008 (-0.044 - 0.060)	0.008 (-0.024 - 0.040)	0.009 (-0.033 - 0.051)
IT*Sept	0.042** (0.004 - 0.081)	0.042** (0.003 - 0.082)	0.046** (0.001 - 0.091)
IT*Oct	0.026 (-0.012 - 0.064)	0.044** (0.001 - 0.087)	0.051** (0.009 - 0.093)
IT*Nov	0.001 (-0.059 - 0.060)	0.012 (-0.033 - 0.057)	0.017 (-0.027 - 0.061)
IT*Dec		0.001 (-0.054 - 0.057)	0.016 (-0.031 - 0.063)
NETH*Feb	0.015 (-0.018 - 0.048)	0.020 (-0.017 - 0.058)	0.023 (-0.019 - 0.064)
NETH*Mar	0.005 (-0.047 - 0.056)	0.003 (-0.033 - 0.039)	
NETH*Apr	-0.041** (-0.080 - -0.002)		
NETH*Ma	0.000 (-0.030 - 0.031)	-0.002 (-0.051 - 0.047)	0.004 (-0.030 - 0.038)
NETH*Jun	0.020		0.022

	(-0.011 - 0.050)		(-0.011 - 0.054)
NETH*Jul	0.029	0.021	0.045**
	(-0.021 - 0.080)	(-0.008 - 0.050)	(0.010 - 0.079)
NETH*Aug	0.035	0.033**	0.035*
	(-0.012 - 0.083)	(0.007 - 0.059)	(-0.003 - 0.074)
NETH*Sept	0.016	0.015	0.018
	(-0.013 - 0.045)	(-0.017 - 0.046)	(-0.022 - 0.057)
NETH*Oct	-0.018		
	(-0.052 - 0.016)		
NETH*Nov	-0.011		
	(-0.068 - 0.046)		
NETH*Dec	-0.013	-0.012	
	(-0.057 - 0.031)	(-0.065 - 0.042)	
SP*Feb	-0.006		
	(-0.031 - 0.020)		
SP*Mar	0.001		-0.002
	(-0.048 - 0.050)		(-0.039 - 0.036)
SP*Apr	-0.050***	-0.008	-0.017
	(-0.086 - -0.014)	(-0.044 - 0.027)	(-0.055 - 0.020)
SP*May		-0.002	
		(-0.050 - 0.046)	
SP*Jun	-0.016	-0.035**	-0.017
	(-0.039 - 0.007)	(-0.069 - -0.000)	(-0.040 - 0.007)
SP*Jul	-0.014	-0.021	
	(-0.063 - 0.035)	(-0.046 - 0.004)	
SP*Aug	-0.011	-0.012	-0.011
	(-0.059 - 0.037)	(-0.036 - 0.013)	(-0.049 - 0.027)
SP*Sept			0.004
			(-0.034 - 0.041)
SP*Oct		0.019	0.023
		(-0.017 - 0.054)	(-0.012 - 0.058)
SP*Nov	0.014	0.025	0.029
	(-0.040 - 0.068)	(-0.011 - 0.062)	(-0.008 - 0.066)
SP*Dec	0.017	0.018	0.032
	(-0.028 - 0.062)	(-0.035 - 0.071)	(-0.013 - 0.078)
UK*Feb	-0.000	0.005	0.005
	(-0.050 - 0.049)	(-0.043 - 0.053)	(-0.035 - 0.046)
UK*Mar		-0.002	-0.003
		(-0.047 - 0.044)	(-0.047 - 0.041)
UK*Apr	-0.051*	-0.010	-0.015
	(-0.103 - 0.002)	(-0.059 - 0.039)	(-0.059 - 0.028)
UK*May	0.003		0.005
	(-0.048 - 0.054)		(-0.036 - 0.046)
UK*Jun	0.012	-0.007	0.013
	(-0.034 - 0.058)	(-0.055 - 0.041)	(-0.023 - 0.049)
UK*Jul		-0.007	0.015
		(-0.049 - 0.035)	(-0.023 - 0.053)
UK*Aug		-0.001	
		(-0.042 - 0.039)	
UK*Sept	-0.003	-0.003	
	(-0.049 - 0.044)	(-0.047 - 0.040)	
UK*Oct	-0.012	0.006	0.013
	(-0.064 - 0.040)	(-0.045 - 0.058)	(-0.031 - 0.058)
UK*Nov		0.012	0.019
		(-0.042 - 0.066)	(-0.028 - 0.066)
UK*Dec	-0.001		0.014
	(-0.060 - 0.057)		(-0.035 - 0.062)
US*Feb	0.118***		
	(0.085 - 0.150)		
US*Mar	0.034		
	(-0.020 - 0.089)		

US*May	0.021		
	(-0.012 - 0.055)		
US*Jun	0.077***		
	(0.044 - 0.110)		
US*Jul	0.033		
	(-0.018 - 0.085)		
US*Aug	0.059**		
	(0.008 - 0.109)		
US*Sept	0.061***		
	(0.026 - 0.096)		
US*Oct	-0.000		
	(-0.034 - 0.033)		
US*Nov	0.046		
	(-0.010 - 0.103)		
US*Dec	0.044**		
	(0.002 - 0.087)		
Constant	-4.163***	-4.253***	-11.032***
	(-6.345 - -1.980)	(-7.051 - -1.454)	(-14.210 - -7.855)
N	898	646	636
R-squared	0.959	0.938	0.944

Source: elaboration of the author based on data from Eurostat, ECB, Bank of England, OECD and Federal Reserve Economic Data (St. Louis FED), US National Vital Statistics and US Treasury. EPU index by Beker et al. (2012).
Note: Robust CI in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A1.4: Elasticity of monthly fertility rates to macroeconomic indicators. Southern European countries.

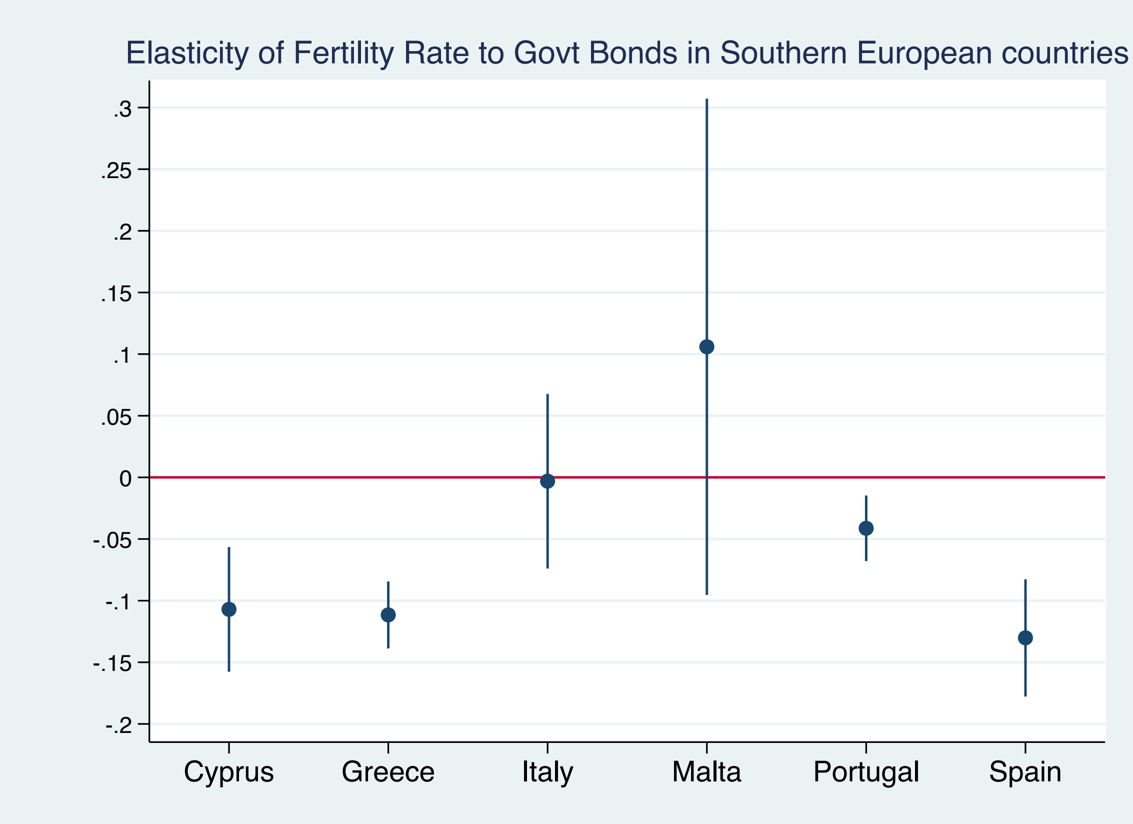
	Model (1)	Model (2)	Model (3)	Model (4)
Unemployment rate	-0.110***	-0.125***	-0.069***	-0.082***
	(-0.127 - -0.092)	(-0.144 - -0.106)	(-0.116 - -0.021)	(-0.127 - -0.036)
10y Govt. Bond Yields	-0.026***		-0.038***	
	(-0.038 - -0.014)		(-0.056 - -0.019)	
Spread in Bond Yields		0.001		-0.020***
		(-0.004 - 0.006)		(-0.031 - -0.009)
Year	0.004***	0.004***	-0.013***	-0.007
	(0.002 - 0.006)	(0.001 - 0.006)	(-0.021 - -0.004)	(-0.016 - 0.002)
Feb	-0.146***	-0.131***	-0.220**	-0.095***
	(-0.234 - -0.057)	(-0.167 - -0.096)	(-0.398 - -0.042)	(-0.127 - -0.062)
Mar	-0.064***	-0.062	-0.002	-0.141
	(-0.109 - -0.020)	(-0.166 - 0.042)	(-0.034 - 0.030)	(-0.324 - 0.042)
Apr	-0.049**	-0.128***	-0.041***	-0.048**
	(-0.091 - -0.008)	(-0.171 - -0.085)	(-0.065 - -0.017)	(-0.094 - -0.001)
Ma	0.005	-0.045**	0.033	-0.197**
	(-0.015 - 0.025)	(-0.082 - -0.008)	(-0.012 - 0.079)	(-0.377 - -0.016)
Jun	-0.032***	-0.128***	-0.021	-0.020
	(-0.051 - -0.014)	(-0.217 - -0.039)	(-0.073 - 0.032)	(-0.075 - 0.035)
Jul	0.038**	0.025**	0.030	0.030
	(0.007 - 0.069)	(0.001 - 0.049)	(-0.030 - 0.090)	(-0.028 - 0.087)
Aug	0.041***	0.040**	0.023	0.027
	(0.011 - 0.070)	(0.009 - 0.070)	(-0.008 - 0.054)	(-0.009 - 0.064)
Sept	0.079***	0.036***	0.061***	0.059***
	(0.047 - 0.111)	(0.012 - 0.059)	(0.016 - 0.106)	(0.023 - 0.095)
Oct	0.061***	0.046***	0.090***	0.051**
	(0.015 - 0.106)	(0.020 - 0.072)	(0.024 - 0.157)	(0.009 - 0.094)
Nov	-0.026	-0.022	0.035	-0.030
	(-0.121 - 0.068)	(-0.058 - 0.014)	(-0.042 - 0.111)	(-0.073 - 0.014)
Dec	-0.054	-0.015	-0.010	0.008
	(-0.207 - 0.098)	(-0.049 - 0.020)	(-0.070 - 0.050)	(-0.068 - 0.085)
Cyprus	-0.090***		-0.049	-0.061**
	(-0.118 - -0.063)		(-0.107 - 0.009)	(-0.119 - -0.003)
Greece	-0.011	0.084***	0.017	0.010
	(-0.045 - 0.023)	(0.047 - 0.121)	(-0.028 - 0.062)	(-0.036 - 0.055)
Italy	-0.061***	0.038***	-0.046	-0.056*
	(-0.085 - -0.038)	(0.010 - 0.066)	(-0.105 - 0.013)	(-0.117 - 0.004)
Malta	-0.032	0.065	0.066	0.053
	(-0.115 - 0.052)	(-0.022 - 0.152)	(-0.112 - 0.244)	(-0.125 - 0.231)
Portugal	-0.101***	-0.002	-0.125***	-0.132***
	(-0.133 - -0.069)	(-0.041 - 0.037)	(-0.174 - -0.077)	(-0.180 - -0.084)
Spain		0.109***		
		(0.077 - 0.141)		
CY*Feb	0.013	-0.001	0.074	-0.050*
	(-0.081 - 0.108)	(-0.049 - 0.047)	(-0.109 - 0.257)	(-0.107 - 0.006)
CY*Mar	0.038	0.040	-0.021	0.120
	(-0.017 - 0.093)	(-0.070 - 0.149)	(-0.081 - 0.039)	(-0.070 - 0.310)
CY*Apr	-0.077***		-0.106**	-0.096**
	(-0.134 - -0.021)		(-0.187 - -0.024)	(-0.188 - -0.004)
CY*May	-0.098***	-0.048*	-0.120***	0.114
	(-0.142 - -0.053)	(-0.103 - 0.007)	(-0.202 - -0.038)	(-0.079 - 0.307)
CY*Jun	0.013	0.108**	-0.021	-0.016
	(-0.028 - 0.054)	(0.011 - 0.206)	(-0.087 - 0.045)	(-0.085 - 0.052)
CY*Jul	0.029	0.041*		0.005
	(-0.021 - 0.079)	(-0.006 - 0.087)		(-0.078 - 0.089)
CY*Aug	0.040**	0.040**	0.038	0.039
	(0.002 - 0.079)	(0.001 - 0.080)	(-0.012 - 0.088)	(-0.016 - 0.094)
CY*Sept	0.076***	0.119***	0.053	0.059

	(0.028 - 0.125)	(0.075 - 0.163)	(-0.030 - 0.136)	(-0.022 - 0.139)
CY*Oct	0.057*	0.071***		0.044
	(-0.001 - 0.116)	(0.025 - 0.118)		(-0.036 - 0.124)
CY*Nov	0.084	0.079***		0.069
	(-0.017 - 0.186)	(0.028 - 0.130)		(-0.020 - 0.158)
CY*Dec	0.094	0.054**	0.044	0.031
	(-0.063 - 0.250)	(0.002 - 0.105)	(-0.035 - 0.123)	(-0.060 - 0.122)
GR*Feb	0.015		0.076	-0.050*
	(-0.082 - 0.111)		(-0.108 - 0.259)	(-0.105 - 0.005)
GR*Mar		-0.004	-0.053*	0.085
		(-0.116 - 0.108)	(-0.108 - 0.002)	(-0.104 - 0.274)
GR*Apr	-0.078***	-0.000	-0.097***	-0.091***
	(-0.135 - -0.022)	(-0.055 - 0.055)	(-0.150 - -0.044)	(-0.156 - -0.027)
GR*May	-0.050**		-0.098***	0.131
	(-0.093 - -0.006)		(-0.163 - -0.033)	(-0.055 - 0.318)
GR*Jun	0.025	0.121**	-0.010	-0.011
	(-0.015 - 0.065)	(0.025 - 0.216)	(-0.075 - 0.054)	(-0.077 - 0.056)
GR*Jul	0.067***	0.081***	0.052	0.054
	(0.016 - 0.118)	(0.036 - 0.126)	(-0.018 - 0.121)	(-0.015 - 0.122)
GR*Aug	-0.008	-0.006	-0.008	-0.010
	(-0.057 - 0.041)	(-0.053 - 0.040)	(-0.061 - 0.044)	(-0.065 - 0.045)
GR*Sept	-0.006	0.037*	-0.004	
	(-0.057 - 0.045)	(-0.006 - 0.081)	(-0.061 - 0.053)	
GR*Oct	0.002	0.017	-0.042	
	(-0.059 - 0.062)	(-0.028 - 0.063)	(-0.120 - 0.036)	
GR*Nov	0.004		-0.067	
	(-0.098 - 0.106)		(-0.154 - 0.019)	
GR*Dec	-0.013	-0.051*	-0.065*	-0.078*
	(-0.171 - 0.145)	(-0.103 - 0.001)	(-0.136 - 0.007)	(-0.165 - 0.008)
IT*Feb	0.034	0.020	0.115	-0.009
	(-0.057 - 0.126)	(-0.022 - 0.062)	(-0.068 - 0.299)	(-0.064 - 0.046)
IT*Mar	0.022	0.019	-0.041	0.100
	(-0.031 - 0.075)	(-0.089 - 0.127)	(-0.095 - 0.012)	(-0.089 - 0.289)
IT*Apr	-0.076***	0.002	-0.084***	-0.076**
	(-0.129 - -0.024)	(-0.052 - 0.055)	(-0.137 - -0.031)	(-0.142 - -0.009)
IT*Ma	-0.022	0.027	-0.062*	0.171*
	(-0.064 - 0.019)	(-0.024 - 0.079)	(-0.136 - 0.011)	(-0.020 - 0.361)
IT*Jun	-0.028**	0.067	-0.055	-0.052
	(-0.057 - -0.000)	(-0.024 - 0.159)	(-0.122 - 0.011)	(-0.122 - 0.018)
IT*Jul		0.012	-0.005	
		(-0.026 - 0.051)	(-0.086 - 0.076)	
IT*Aug			0.030	0.031
			(-0.025 - 0.086)	(-0.030 - 0.091)
IT*Sept		0.043**		0.006
		(0.002 - 0.083)		(-0.053 - 0.064)
IT*Oct	0.012	0.027	-0.020	0.023
	(-0.042 - 0.067)	(-0.013 - 0.067)	(-0.111 - 0.072)	(-0.056 - 0.102)
IT*Nov	0.009	0.004	-0.030	0.038
	(-0.092 - 0.109)	(-0.045 - 0.053)	(-0.118 - 0.057)	(-0.024 - 0.099)
IT*Dec	0.040			-0.014
	(-0.116 - 0.196)			(-0.111 - 0.083)
MA*Feb		-0.015		-0.124
		(-0.110 - 0.081)		(-0.301 - 0.052)
MA*Mar	0.003		-0.140	
	(-0.110 - 0.117)		(-0.329 - 0.048)	
MA*Apr	-0.139***	-0.061	-0.245***	-0.237***
	(-0.238 - -0.041)	(-0.160 - 0.038)	(-0.421 - -0.068)	(-0.414 - -0.059)
MA*May	-0.132***	-0.082	-0.233**	
	(-0.231 - -0.033)	(-0.185 - 0.021)	(-0.423 - -0.043)	
MA*Jun	-0.096**		-0.212**	-0.210**
	(-0.188 - -0.005)		(-0.400 - -0.025)	(-0.394 - -0.025)

MA*Jul	-0.099*	-0.085*	-0.121	-0.117
	(-0.201 - 0.004)	(-0.186 - 0.016)	(-0.310 - 0.068)	(-0.303 - 0.068)
MA*Aug	-0.074	-0.073	-0.102	-0.102
	(-0.169 - 0.020)	(-0.168 - 0.022)	(-0.282 - 0.078)	(-0.280 - 0.076)
MA*Sept	-0.067	-0.023	-0.100	-0.096
	(-0.161 - 0.028)	(-0.115 - 0.069)	(-0.279 - 0.079)	(-0.269 - 0.077)
MA*Oct	-0.027	-0.013	-0.141	-0.098
	(-0.131 - 0.076)	(-0.109 - 0.083)	(-0.346 - 0.064)	(-0.293 - 0.098)
MA*Nov		-0.005	-0.126	-0.059
		(-0.107 - 0.096)	(-0.317 - 0.064)	(-0.235 - 0.118)
MA*Dec		-0.040	-0.236	-0.251
		(-0.196 - 0.115)	(-0.599 - 0.127)	(-0.613 - 0.112)
PO*Feb	0.037	0.023	0.113	-0.013
	(-0.062 - 0.137)	(-0.036 - 0.082)	(-0.073 - 0.299)	(-0.077 - 0.051)
PO*Mar	0.052	0.049	-0.008	0.131
	(-0.010 - 0.113)	(-0.065 - 0.162)	(-0.068 - 0.053)	(-0.059 - 0.322)
PO*Apr		0.078**	-0.006	
		(0.017 - 0.139)	(-0.059 - 0.047)	
PO*May	0.012	0.061**		0.230**
	(-0.029 - 0.052)	(0.009 - 0.114)		(0.044 - 0.416)
PO*Jun	0.006	0.101**		
	(-0.041 - 0.053)	(0.001 - 0.202)		
PO*Jul	0.004	0.018	0.016	0.017
	(-0.047 - 0.055)	(-0.031 - 0.067)	(-0.060 - 0.092)	(-0.059 - 0.092)
PO*Aug	0.005	0.007	0.021	0.017
	(-0.047 - 0.057)	(-0.047 - 0.060)	(-0.040 - 0.082)	(-0.047 - 0.082)
PO*Sept	0.016	0.060**	0.026	0.028
	(-0.040 - 0.072)	(0.006 - 0.114)	(-0.050 - 0.102)	(-0.041 - 0.098)
PO*Oct		0.013	-0.045	-0.003
		(-0.043 - 0.069)	(-0.145 - 0.056)	(-0.088 - 0.081)
PO*Nov	0.037	0.033	-0.023	0.044
	(-0.067 - 0.141)	(-0.024 - 0.089)	(-0.132 - 0.085)	(-0.043 - 0.132)
PO*Dec	0.062	0.017	0.015	
	(-0.097 - 0.220)	(-0.041 - 0.075)	(-0.082 - 0.112)	
SP*Feb	0.048	0.034	0.124	
	(-0.043 - 0.140)	(-0.010 - 0.077)	(-0.056 - 0.305)	
SP*Mar	0.059**	0.056		0.141
	(0.009 - 0.109)	(-0.051 - 0.163)		(-0.046 - 0.327)
SP*Apr	0.013	0.091***		0.008
	(-0.034 - 0.060)	(0.042 - 0.140)		(-0.046 - 0.062)
SP*May		0.050**	-0.040	0.192**
		(0.007 - 0.094)	(-0.094 - 0.015)	(0.009 - 0.376)
SP*Jun		0.096**	-0.023	-0.020
		(0.005 - 0.188)	(-0.083 - 0.037)	(-0.084 - 0.044)
SP*Jul	-0.013		-0.019	-0.014
	(-0.051 - 0.026)		(-0.082 - 0.045)	(-0.078 - 0.050)
SP*Aug	-0.020	-0.020		
	(-0.059 - 0.019)	(-0.060 - 0.021)		
SP*Sept	-0.043**		-0.038	-0.032
	(-0.082 - -0.005)		(-0.088 - 0.012)	(-0.074 - 0.010)
SP*Oct	-0.015		-0.043	0.001
	(-0.066 - 0.037)		(-0.113 - 0.026)	(-0.048 - 0.049)
SP*Nov	0.021	0.016	-0.039	0.030
	(-0.077 - 0.119)	(-0.028 - 0.061)	(-0.121 - 0.043)	(-0.022 - 0.081)
SP*Dec	0.056	0.017	0.007	-0.007
	(-0.100 - 0.212)	(-0.032 - 0.065)	(-0.072 - 0.085)	(-0.097 - 0.083)
Constant	-4.178*	-3.319	29.869***	18.046**
	(-8.480 - 0.123)	(-8.541 - 1.903)	(12.737 - 47.001)	(0.515 - 35.578)
N	782	777	332	332
R-squared	0.674	0.670	0.727	0.726

Source: elaboration of the author based on data from Eurostat, ECB, Bank of England, OECD and Federal Reserve Economic Data (St. Louis FED), US National Vital Statistics and US Treasury. EPU index by Beker et al. (2012).Note: Robust CI in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Figure A1.5: Elasticity of monthly General Fertility Rate in Southern European countries.



Source: elaboration of the author based on data from ECB.

APPENDIX 2

Table A2.1: Summary Statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
Child Birth date	2495	554.9	26.4	516 (Jan. 2003)	623 (Dec. 2011)
First Child Birth	5375	0.096	0.29	0	1
US State	5375	27.97	15.47	1	56
Year	5375	2008	2.62	2003	2011
State Unemployment Rate	5375	7.31	2.48	2.59	13.41
State Unemployment Rate Quartiles	5375	2.49	1.12	1	4
Head Employment Status	5347	1.04	0.36	0	2
Wife Employment Status	5308	1.31	0.78	0	3
Head in Job Market	5375	0.86	0.34	0	1
Wife in Job Market	5375	0.72	0.45	0	1
Head Employment Status (+ Students)	5347	1.11	0.52	0	4
Wife Employment Status (+ Students)	5308	1.03	0.76	0	4
Couple	5375	2.31	0.98	0	3
Couple Detailed	4640	0.97	1.89	0	8
Heads age	5375	30.53	5.41	18	45
Wives age	5375	29.28	5.90	16	49
Heads Marital Status	5373	1.35	0.71	1	4
Head Education	3781	4.72	1.41	1	8
Wife Education	3537	5.15	1.53	1	8
Head High Education	5375	0.27	0.44	0	1
Wife High Education	5375	0.33	0.47	0	1
Head Race	5321	1.35	0.59	1	3
Wife Race	5286	1.32	0.58	1	3
Migrant	5375	0.05	0.22	0	1

Source: Elaboration of the author based on PSID data.

Table A2.2: Distribution of couples' working status (episodes) across waves.

	2003	2005	2007	2009	2011
Dual Earners	73,48	71,6	69,89	61,12	59,9
HD Employed - WF Out of LF	10,22	15,95	16,63	16,74	17,5
HD Employed - WF Unemployed	4,72	3,5	4,95	5,4	6,56
HD Out of LF - WF Employed	4,72	3,24	2,63	3,1	2,73
HD Out of LF - WF Unemployed	0,2	0,13	0,32	0,53	0,62
HD Unemployed - WF Out of LF	0,79	1,04	0,74	2,04	2,58
HD Unemployed - WF Employed	3,93	2,72	3,37	7,88	6,4
Both Out of LF	1,18	1,04	0,95	1,06	1,64
Both Unemployed	0,79	0,78	0,53	2,13	1,95

Source: Elaboration of the author based on PSID data. Number of episodes in parenthesis.

Table A2.3: Distribution of couples' working status (childless, and months before and after first birth).

Couples' Working status	1 Childless (Episodes)	2 36 months before First Child	3 12 months before First Child	4 12 months after First Child	5 36 months after First Child
Both Out of LM	3.41% (73)	0.00% (0)	1.59% (4)	4.44% (15)	2.97% (6)
Only HD works	19.39% (415)	6.82% (6)	9.56% (24)	39.35% (133)	30.2% (61)
Only WF works	7.80% (167)	10.23% (9)	8.37% (21)	4.73% (16)	4.95% (10)
Dual Earners	69.39% (1485)	82.95% (73)	80.48% (202)	51.48% (174)	61.88% (125)
Total	100% (2140)	100% (88)	100% (251)	100% (338)	100% (202)

Source: Elaboration of the author based on PSID data.

APPENDIX 3

Table A3.1: Occupation Titles and Codes (CENSUS 2002)

Code	Occupation Title
1-43	Management Occupations
50 - 73	Business Operations Specialists
80 - 95	Financial Specialists
100 - 124	Computer and Mathematical Occupations
130 - 156	Architecture and Engineering Occupations
160 - 196	Life, Physical, and Social Science Occupations
200 - 206	Community and Social Services Occupations
210 - 215	Legal Occupations
220 - 255	Education, Training, and Library Occupations
260 - 296	Arts, Design, Entertainment, Sports, and Media Occupations
300 - 354	Healthcare Practitioners and Technical Occupations
360 - 365	Healthcare Support Occupations
370 - 395	Protective Service Occupations
400 - 416	Food Preparation and Serving Occupations
420 - 425	Building and Grounds Cleaning and Maintenance Occupations
430 - 465	Personal Care and Service Occupations
470 - 496	Sales Occupations
500 - 593	Office and Administrative Support Occupations
600 - 613	Farming, Fishing, and Forestry Occupations
620 - 676	Construction Trades
680 - 694	Extraction Workers
700 - 762	Installation, Maintenance, and Repair Workers
770 - 896	Production Occupations
900 - 975	Transportation and Material Moving Occupations
980 - 983	Military Specific Occupations

Source: CENSUS OF POPULATION AND HOUSING: ALPHABETICAL INDEX OF INDUSTRIES AND OCCUPATIONS issued by the U.S. Department of Commerce and the Bureau of the Census.

Table A3.2: Top High and Top low SEI and relative Occupation

Code	H&W SEI	Occupation Title
834	7.55	Top stitcher
832	9.56	Tie maker
842	10.95	Spool tender
841	13.56	Latcher
831	13.59	Shirt ironer
414	15.55	Dish stacker
423	15.72	Maid \ n.s.
416	15.94	Food mobile driver
853	16.1	Gang saw operator
880	17.58	Capsule filler
403	17.61	Culinary worker
840	18.03	Cutter, cloth
412	18.09	Curb attendant
604	18.59	Chicken sexer
961	18.77	Sanitation worker, cleaning machinery
		[…]
145	61.77	Engineer, plating
493	61.99	Engineer, sales
171	62.45	Physical meteorologist
146	62.56	Engineer, hydraulic
106	63.81	Data recovery planner
104	63.94	Computer specialist, exc. software
136	64.07	Engineer, design \ n.s.
152	64.27	Engineer, natural gas
140	64.44	Computer designer
111	64.57	Web producer
153	64.73	Engineer, salvage
142	64.81	Engineer, industrial, hygiene
305	65.06	Pharmacist
331	65.75	Oral hygienist
314	66.92	Audiologist
323	66.92	Speech clinician
121	68.34	Mathematician
326	69.2	Naturopathic doctor
135	69.92	Engineer, plant
180	70.46	Price economist
151	70.66	Engineer, radiological
325	70.86	Public health veterinarian
132	71.46	Engineer, vibration
120	71.8	Actuary
183	73.23	Research worker, social welfare
210	79.11	Manager, legal department
306	80.5	Physicians and Surgeons

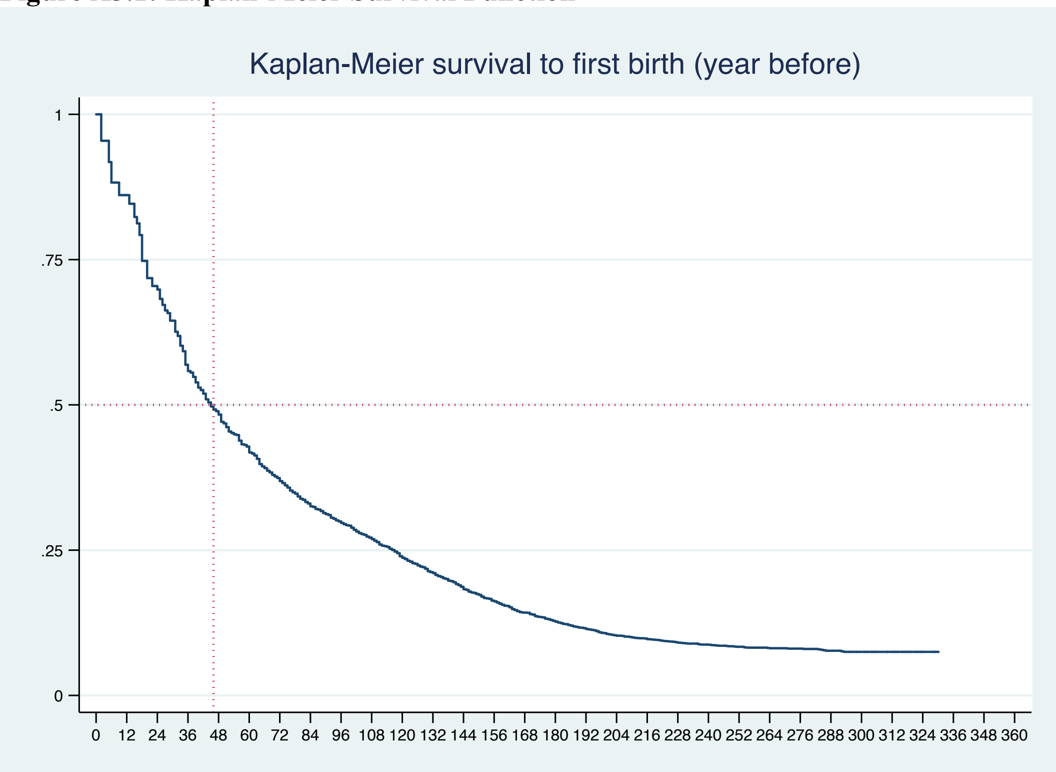
Source: Hauser and Warren (1997) and Frederick, C., 2010.

Table A3.3: Summary Statistics

Variable	#Obs.	Mean	Std. Dev.	Min	Max
Years of Education	22798	14.20	2.05	6	17
Birth date	24805	215.18	66.90	72 (01/1966)	336 (01/1988)
State Unemployment Rate	24668	6.48	2.28	2.4	14.2
State Unemployment Rate (Cent.)	24668	1.48	2.28	-2.6	9.2
Relative Job SEI	15084	1.17	.547	0.21	6.22
Relative Job SEI (Categorical)	15074	1.56	0.50	1	2
SEI Absolute	14493	40.91	14.40	8.84	80.5
Average Parents' SEI	21790	37.41	14.16	7.55	80.5
Employment Status with Mobility (Categorical)	19268	1.22	0.78	0	2
Siblings	24763	2.14	1.83	0	13
Marital Status	21241	0.97	0.82	0	3
Race	24674	1.43	0.59	1	3
Date of First Child Birth	2510	569.9	27.74	519 (03/2003)	620 (08/2011)

Source: Elaboration of the author based on PSID survey.

Figure A3.1: Kaplan-Meier Survival Function



Source: Elaboration of the author based on PSID survey.

Table A3.4: Education and marital status mediation effect on the effect of the Great Recession on first birth.

	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)	Model (8)
Pre- Recession: <Dec 2007 (Ref. Cat)								
Recession: Dec2007-Jun2009	0.65***	0.67***	0.65***	0.67***	0.64***	0.64***	0.69***	0.71***
	(0.54 - 0.78)	(0.56 - 0.81)	(0.53 - 0.79)	(0.55 - 0.82)	(0.51 - 0.79)	(0.51 - 0.80)	(0.54 - 0.87)	(0.56 - 0.91)
Post-Recession: >Jun2009	0.66***	0.67***	0.77**	0.80*	0.54***	0.54***	0.68**	0.71**
	(0.53 - 0.82)	(0.54 - 0.83)	(0.62 - 0.97)	(0.64 - 1.01)	(0.41 - 0.71)	(0.41 - 0.71)	(0.51 - 0.91)	(0.53 - 0.96)
Downward mobile (Ref. Cat)								
Upward mobile					1.26**	1.25**	1.23**	1.25**
					(1.03 - 1.53)	(1.02 - 1.54)	(1.01 - 1.50)	(1.02 - 1.55)
Out of Labor Force					2.10***	2.20***	2.07***	2.18***
					(1.68 - 2.61)	(1.75 - 2.78)	(1.64 - 2.63)	(1.70 - 2.80)
Cohort <1974 (Ref. Cat)								
Cohort 1974-1980	1.75***	2.03***	1.76***	1.93***	1.92***	2.16***	1.92***	2.00***
	(1.31 - 2.34)	(1.48 - 2.79)	(1.31 - 2.35)	(1.40 - 2.66)	(1.34 - 2.74)	(1.48 - 3.17)	(1.34 - 2.75)	(1.37 - 2.93)
Cohort >1980	3.38***	4.09***	3.33***	3.64***	4.02***	4.72***	3.87***	3.97***
	(2.24 - 5.12)	(2.63 - 6.35)	(2.18 - 5.08)	(2.30 - 5.77)	(2.42 - 6.66)	(2.77 - 8.02)	(2.32 - 6.45)	(2.31 - 6.80)
Single (Ref. Cat.)								
Married			6.21***	5.92***			6.74***	6.44***
			(4.72 - 8.17)	(4.47 - 7.84)			(4.91 - 9.24)	(4.66 - 8.90)
Cohabiting			3.15***	3.27***			2.76***	2.91***
			(2.27 - 4.38)	(2.34 - 4.58)			(1.86 - 4.07)	(1.95 - 4.34)
Divorced/Separated			1.33	1.24			1.66	1.63
			(0.75 - 2.35)	(0.67 - 2.30)			(0.87 - 3.19)	(0.82 - 3.24)
Years completed Education		0.98		1.01		1.03		1.05**
		(0.95 - 1.02)		(0.97 - 1.06)		(0.99 - 1.08)		(1.00 - 1.11)
Number of Siblings				1.06***				1.05*
				(1.02 - 1.10)				(1.00 - 1.10)
White non-Hispanic (Ref. Cat)								
Africana American				1.04				1.05
				(0.90 - 1.21)				(0.87 - 1.27)
Other race				0.93				0.83
				(0.68 - 1.27)				(0.53 - 1.30)
US State FE	YES	YES	YES	YES	YES	YES	YES	YES
N	24,805	22,802	21,262	19,354	19,279	17,927	16,573	15,245

Source: Elaboration of the author based on PSID data.
Note: Odds rations with Confidence Intervals in parentheses. *** p<0.01, ** p<0.05, * p<0.1. State unemployment centered at the mean

APPENDIX 4

Table A4.1: Complementary analysis on the effect of state unemployment rate on childlessness (ACS). Robustness checks varying the bandwidth.

37-40 years old women				
	Model (1)	Model (2)	Model (3)	Model (4)
Mean-cent. State Unemployment rate (lagged) [a]	-0.001	-0.001	-0.002**	-0.002***
	(-0.003 - 0.000)	(-0.003 - 0.000)	(-0.003 - -0.000)	(-0.003 - -0.001)
Education [b]				
Completed Highschool		-0.006***	-0.022***	0.015***
		(-0.011 - -0.002)	(-0.026 - -0.017)	(0.011 - 0.019)
Some college but no degree		-0.028***	-0.047***	-0.001
		(-0.033 - -0.024)	(-0.051 - -0.042)	(-0.006 - 0.003)
Associate's degree		-0.035***	-0.058***	0.000
		(-0.040 - -0.030)	(-0.063 - -0.052)	(-0.005 - 0.005)
Bachelor's degree		-0.006**	-0.023***	0.035***
		(-0.010 - -0.001)	(-0.028 - -0.019)	(0.031 - 0.040)
Master's degree or higher		0.025***	-0.001	0.056***
		(0.019 - 0.030)	(-0.006 - 0.005)	(0.052 - 0.061)
Employment status [c]				
Unemployed			0.036***	0.003
			(0.030 - 0.042)	(-0.003 - 0.008)
Not in labor force			-0.097***	-0.050***
			(-0.099 - -0.094)	(-0.052 - -0.048)
Marital status [d]				
Married, spouse absent				0.330***
				(0.320 - 0.341)
Separated				0.128***
				(0.121 - 0.134)
Divorced				0.229***
				(0.225 - 0.232)
Widowed				0.164***
				(0.152 - 0.177)
Never married/single				0.622***
				(0.618 - 0.625)
Year Fixed Effect	Yes	Yes	Yes	Yes
State Fixed Effect	Yes	Yes	Yes	Yes
Constant	0.216***	0.226***	0.267***	0.125***
	(0.206 - 0.226)	(0.215 - 0.237)	(0.256 - 0.278)	(0.115 - 0.135)
N	598686	596121	596121	596121

Source: Elaboration of the author based on ACS data. Notes: * p≤0.05, ** p≤0.01, *** p≤0.001. Robust Confidence intervals in parenthesis. [a] Mean state unemployment rate in the period 2000-2012 is 6.36%. [b] Reference category is Less than High school. [c] Reference category is being employed. [d] Reference category is Married with spouse present. [e] Years available are 2000-2012, the reference year is 2010. [f] Reference state is Alabama.

Table A4.1 cont'd: Complementary analysis on the effect of state unemployment rate on childlessness (ACS). Robustness checks varying the bandwidth.

36-40 years old women				
	Model (1)	Model (2)	Model (3)	Model (4)
Mean-cent. State Unemployment rate (lagged) [a]	-0.001	-0.001	-0.001**	-0.002***
	(-0.002 - 0.000)	(-0.002 - 0.000)	(-0.003 - -0.000)	(-0.003 - -0.001)
Education [b]				
Completed Highschool		-0.006***	-0.022***	0.015***
		(-0.010 - -0.001)	(-0.026 - -0.017)	(0.012 - 0.019)
Some college but no degree		-0.026***	-0.045***	0.001
		(-0.030 - -0.022)	(-0.049 - -0.041)	(-0.003 - 0.005)
Associate's degree		-0.031***	-0.055***	0.004*
		(-0.035 - -0.026)	(-0.059 - -0.050)	(-0.000 - 0.008)
Bachelor's degree		0.002	-0.017***	0.043***
		(-0.002 - 0.006)	(-0.021 - -0.013)	(0.040 - 0.047)
Master's degree or higher		0.034***	0.008***	0.066***
		(0.029 - 0.039)	(0.003 - 0.012)	(0.062 - 0.070)
Employment status [c]				
Unemployed			0.034***	0.002
			(0.028 - 0.039)	(-0.003 - 0.006)
Not in labor force			-0.101***	-0.052***
			(-0.103 - -0.099)	(-0.054 - -0.050)
Marital status [d]				
Married, spouse absent				0.333***
				(0.324 - 0.343)
Separated				0.125***
				(0.119 - 0.131)
Divorced				0.229***
				(0.226 - 0.232)
Widowed				0.162***
				(0.151 - 0.174)
Never married/single				0.619***
				(0.616 - 0.622)
Year Fixed Effect	Yes	Yes	Yes	Yes
State Fixed Effect	Yes	Yes	Yes	Yes
Constant	0.209***	0.215***	0.259***	0.114***
	(0.200 - 0.218)	(0.206 - 0.225)	(0.249 - 0.268)	(0.105 - 0.122)
N	737614	734451	734451	734451

Source: Elaboration of the author based on ACS data. Notes: * p≤0.05, ** p≤0.01, *** p≤0.001. Robust Confidence intervals in parenthesis. [a] Mean state unemployment rate in the period 2000-2012 is 6.36%. [b] Reference category is Less than High school. [c] Reference category is being employed. [d] Reference category is Married with spouse present. [e] Years available are 2000-2012, the reference year is 2010. [f] Reference state is Alabama.

Table A4.1 cont'd: Complementary analysis on the effect of state unemployment rate on childlessness (ACS). Robustness checks varying the bandwidth.

36-41 years old women				
	Model (1)	Model (2)	Model (3)	Model (4)
Mean-cent. State Unemployment rate (lagged) [a]	-0.001**	-0.001**	-0.002***	-0.002***
	(-0.003 - -0.000)	(-0.002 - -0.000)	(-0.003 - -0.000)	(-0.003 - -0.001)
Education [b]				
Completed Highschool		-0.007***	-0.023***	0.014***
		(-0.011 - -0.004)	(-0.027 - -0.019)	(0.010 - 0.017)
Some college but no degree		-0.029***	-0.048***	-0.002
		(-0.033 - -0.025)	(-0.052 - -0.044)	(-0.006 - 0.001)
Associate's degree		-0.035***	-0.058***	-0.001
		(-0.039 - -0.030)	(-0.062 - -0.054)	(-0.005 - 0.003)
Bachelor's degree		-0.007***	-0.025***	0.034***
		(-0.011 - -0.003)	(-0.029 - -0.021)	(0.030 - 0.037)
Master's degree or higher		0.025***	-0.001	0.055***
		(0.020 - 0.029)	(-0.005 - 0.004)	(0.051 - 0.059)
Employment status [c]				
Unemployed			0.037***	0.004
			(0.032 - 0.042)	(-0.001 - 0.008)
Not in labor force			-0.097***	-0.050***
			(-0.099 - -0.095)	(-0.052 - -0.049)
Marital status [d]				
Married, spouse absent				0.330***
				(0.322 - 0.339)
Separated				0.127***
				(0.122 - 0.133)
Divorced				0.229***
				(0.226 - 0.232)
Widowed				0.163***
				(0.152 - 0.173)
Never married/single				0.620***
				(0.617 - 0.622)
Year Fixed Effect	Yes	Yes	Yes	Yes
State Fixed Effect	Yes	Yes	Yes	Yes
Constant	0.213***	0.224***	0.265***	0.122***
	(0.205 - 0.221)	(0.215 - 0.232)	(0.256 - 0.274)	(0.114 - 0.130)
N	893947	890173	890173	890173

Source: Elaboration of the author based on ACS data. Notes: * p≤0.05, ** p≤0.01, *** p≤0.001. Robust Confidence intervals in parenthesis. [a] Mean state unemployment rate in the period 2000-2012 is 6.36%. [b] Reference category is Less than High school. [c] Reference category is being employed. [d] Reference category is Married with spouse present. [e] Years available are 2000-2012, the reference year is 2010. [f] Reference state is Alabama.

Table A4.2: Complementary analysis on the effect of state unemployment rate on childlessness (ACS). Robustness check for different age groups.

20-24 years old women				
	Model1	Model2	Model3	Model4
	(1)	(2)	(3)	(4)
Mean-cent. State Unemployment rate (lagged)	0.003***	0.003***	0.003***	0.002***
	(0.001 - 0.004)	(0.002 - 0.004)	(0.002 - 0.005)	(0.001 - 0.003)
Education [b]				
Completed Highschool		0.130***	0.109***	0.092***
		(0.125 - 0.135)	(0.104 - 0.114)	(0.088 - 0.097)
Some college but no degree		0.271***	0.246***	0.192***
		(0.266 - 0.276)	(0.241 - 0.251)	(0.188 - 0.196)
Associate's degree		0.282***	0.249***	0.224***
		(0.276 - 0.287)	(0.244 - 0.255)	(0.219 - 0.229)
Bachelor's degree		0.373***	0.337***	0.293***
		(0.368 - 0.378)	(0.332 - 0.341)	(0.288 - 0.297)
Master's degree or higher		0.358***	0.323***	0.300***
		(0.351 - 0.365)	(0.317 - 0.330)	(0.293 - 0.307)
Employment status [c]				
Unemployed			-0.052***	-0.055***
			(-0.056 - -0.048)	(-0.059 - -0.051)
Not in labor force			-0.104***	-0.073***
			(-0.106 - -0.101)	(-0.075 - -0.071)
Marital status [d]				
Married, spouse absent				0.203***
				(0.194 - 0.212)
Separated				-0.011*
				(-0.023 - 0.000)
Divorced				0.082***
				(0.072 - 0.092)
Widowed				0.196***
				(0.158 - 0.233)
Never married/single				0.411***
				(0.408 - 0.414)
Year Fixed Effect	Yes	Yes	Yes	Yes
State Fixed Effect	Yes	Yes	Yes	Yes
Constant	0.749***	0.522***	0.581***	0.333***
	(0.739 - 0.759)	(0.511 - 0.532)	(0.570 - 0.592)	(0.323 - 0.342)
N	579529	576438	576438	576438

Source: Elaboration of the author based on ACS data. Notes: * p≤0.05, ** p≤0.01, *** p≤0.001. Robust Confidence intervals in parenthesis.. [a] Mean state unemployment rate in the period 2000-2012 is 6.36%. [b] Reference category is Less than High school. [c] Reference category is being employed. [d] Reference category is Married with spouse present. [e] Years available are 2000-2012, the reference year is 2010. [f] Reference state is Alabama.

Table A4.2 cont'd: Complementary analysis on the effect of state unemployment rate on childlessness (ACS). Robustness check for different age groups.

25-29 years old women				
	Model1 (1)	Model2 (2)	Model3 (3)	Model4 (4)
Mean-cent. State Unemployment rate (lagged)	-0.001	0.001	0.001	-0.001
	(-0.002 - 0.001)	(-0.001 - 0.003)	(-0.001 - 0.002)	(-0.002 - 0.001)
Education [b]				
Completed Highschool		0.054***	0.011***	0.028***
		(0.049 - 0.059)	(0.006 - 0.016)	(0.024 - 0.033)
Some college but no degree		0.105***	0.046***	0.068***
		(0.100 - 0.110)	(0.041 - 0.051)	(0.064 - 0.073)
Associate's degree		0.165***	0.091***	0.132***
		(0.159 - 0.171)	(0.085 - 0.097)	(0.127 - 0.138)
Bachelor's degree		0.389***	0.306***	0.312***
		(0.385 - 0.394)	(0.301 - 0.311)	(0.307 - 0.316)
Master's degree or higher		0.436***	0.346***	0.363***
		(0.431 - 0.442)	(0.340 - 0.351)	(0.358 - 0.368)
Employment status [c]				
Unemployed			-0.050***	-0.067***
			(-0.055 - -0.044)	(-0.072 - -0.062)
Not in labor force			-0.219***	-0.149***
			(-0.222 - -0.216)	(-0.152 - -0.146)
Marital status [d]				
Married, spouse absent				0.251***
				(0.242 - 0.259)
Separated				0.053***
				(0.045 - 0.061)
Divorced				0.141***
				(0.136 - 0.147)
Widowed				0.147***
				(0.122 - 0.172)
Never married/single				0.431***
				(0.428 - 0.433)
Year Fixed Effect	Yes	Yes	Yes	Yes
State Fixed Effect	Yes	Yes	Yes	Yes
Constant	0.483***	0.287***	0.405***	0.231***
	(0.471 - 0.495)	(0.275 - 0.299)	(0.393 - 0.417)	(0.221 - 0.242)
N	613982	611664	611664	611664

Source: Elaboration of the author based on ACS data. Notes: * p≤0.05, ** p≤0.01, *** p≤0.001. Robust Confidence intervals in parenthesis.. [a] Mean state unemployment rate in the period 2000-2012 is 6.36%. [b] Reference category is Less than High school. [c] Reference category is being employed. [d] Reference category is Married with spouse present. [e] Years available are 2000-2012, the reference year is 2010. [f] Reference state is Alabama.

Table A4.2 cont'd: Complementary analysis on the effect of State Unemployment rate on childlessness (ACS). Robustness check for different age groups.

30-34 years old women				
	Model1 (1)	Model2 (2)	Model3 (3)	Model4 (4)
Mean-cent. State Unemployment rate (lagged)	-0.000	0.000	-0.001	-0.002**
	(-0.002 - 0.001)	(-0.001 - 0.002)	(-0.002 - 0.001)	(-0.003 - -0.000)
Education [b]				
Completed Highschool		0.018***	-0.013***	0.017***
		(0.013 - 0.022)	(-0.018 - -0.009)	(0.013 - 0.021)
Some college but no degree		0.019***	-0.021***	0.022***
		(0.014 - 0.023)	(-0.025 - -0.016)	(0.018 - 0.026)
Associate's degree		0.034***	-0.017***	0.045***
		(0.029 - 0.039)	(-0.022 - -0.011)	(0.041 - 0.050)
Bachelor's degree		0.152***	0.103***	0.158***
		(0.148 - 0.157)	(0.098 - 0.107)	(0.154 - 0.162)
Master's degree or higher		0.218***	0.156***	0.215***
		(0.213 - 0.223)	(0.151 - 0.161)	(0.211 - 0.220)
Employment status [c]				
Unemployed			0.000	-0.032***
			(-0.006 - 0.006)	(-0.037 - -0.027)
Not in labor force			-0.179***	-0.108***
			(-0.181 - -0.176)	(-0.110 - -0.105)
Marital status [d]				
Married, spouse absent				0.320***
				(0.311 - 0.329)
Separated				0.122***
				(0.115 - 0.128)
Divorced				0.216***
				(0.212 - 0.221)
Widowed				0.180***
				(0.162 - 0.198)
Never married/single				0.552***
				(0.549 - 0.554)
Year Fixed Effect	Yes	Yes	Yes	Yes
State Fixed Effect	Yes	Yes	Yes	Yes
Constant	0.262***	0.187***	0.275***	0.106***
	(0.252 - 0.272)	(0.176 - 0.198)	(0.264 - 0.286)	(0.096 - 0.116)
N	645666	643221	643221	643221

Source: Elaboration of the author based on ACS data. Notes: * p≤0.05, ** p≤0.01, *** p≤0.001. Robust Confidence intervals in parenthesis..[a] Mean state unemployment rate in the period 2000-2012 is 6.36%. [b] Reference category is Less than High school. [c] Reference category is being employed. [d] Reference category is Married with spouse present. [e] Years available are 2000-2012, the reference year is 2010. [f] Reference state is Alabama.